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A

TREATISE

ON THE

ANATOMY, PHYSIOLOGY AND DISEASES

OF THE

HUMAN EAR.

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Sed in his [auribus] aliquanto majus periculum est. Nam vitia oculorum intra ipsos nocent; aurium inflammationes doloresque, interdum etiam ad dementiam mortemque præcipitant. Quo magis inter initia protinus succurrendum est, ne majori periculo locus sit.

A. Corn: Celsi. Lib. VI. Cap. vii.

PHILADELPHIA:
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TO

VALENTINE MOTT, M. D.

WHOSE PRE-EMINENCE AMONG LIVING SURGEONS, IS UNIVERSALLY ACKNOWLEDGED, THIS MONOGRAPH IS RESPECTFULLY AND CORDIALLY DEDICATED,

BY HIS FRIEND,

THE AUTHOR.

Entered according to Act of Congress, in the year 1851, by
JAMES BRYAN, M. D.,
In the Clerk's office of the District Court of the United States, for the Eastern District of Pennsylvania.

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PREFACE.

HAVING been in the habit for a number of years past, of delivering a course of lectures each year, to my private classes, on the subject of aural surgery: and having delivered a like course in the autumn of 1850, before the class attending the Philadelphia College of Medicine, the author resolved to embody the matter of those lectures in the following pages.

The universally admitted dearth of American literature on this subject, was another pretty strong incentive to the rash act of printing and publishing a book on a new subject.

In doing it, however, he will at least feel the satisfaction of ploughing in a comparative new field. The operative and theoretical surgery of our country will compare favorably, during the last half century, with that of Europe; and it is hoped that, however imperfect the following little work may be in other respects, that it will exhibit all that is really valuable in American aural surgery, up to the present time.

It will be seen, that personal observation, (which has now extended over twenty years,) in his profession, has been relied on for many of the facts and principles in the treatment of aural diseases,—while the best authorities have been freely, though carefully quoted.

The character of our people, like that of the Anglo-Saxons generally, is decidedly *practical;* the author has, therefore, avoided long dissertations, or theoretical speculations, on subjects purely speculative. Diseases whose existence has not been proved by post-obit or well attested clinical observations, are excluded. He has attempted to present as nearly as possible what is really known, and valuable, and avoided stating several operations which have not as yet received the sanction of the profession.

The itch for publishing novelties has not to his knowledge swayed the course of his pen or thoughts; and he has preferred being a safe guide, to being more brilliant and striking, but less safe.

If his endeavors meet with the approbation of the wise and good of his profession, and at the same time assist the junior practitioner to lessen the number of diseases arranged under the general head of the *opprobria medicorum*, as well as relieve more satisfactorily those who suffer under these very common and difficult diseases, his object will be accomplished. He may add, in conclusion, to the profession,

"Si quid novisti rectius istis
Candidus imperti: si non, his utere mecum."

Hor.

INTRODUCTION.

THE limits of this work will not admit any thing like a proper historical sketch of aural surgery. We will, therefore, merely say in passing that very little has been added in modern times to the anatomy of the Ear.

After the revival of literature, the discoveries of Eustachius, Scarpa and others leave us almost nothing to desire in reference to the Anatomy of this organ.

This is not the case, however, with the *pathology* of the Ear. Of this the older surgeons knew comparatively nothing, as may be easily seen from the speculations promulgated on this subject, with the varied and irregular treatment designed to cure diseases which existed only in the imaginations of the authors.

To Kramer, of Berlin, is doubtless due the credit of directing attention to a more philosophic mode of investigating these hitherto obscure diseases.

To Pilcher, that of a somewhat verbose exposition of what is considered by him, as known on the subject, and to Toynbee, Todd and other English and American

writers is due what we really know of the changes which the delicate structure of this organ is subject to. Deleau's work is chiefly practical, but is encumbered by a number of contrivances and speculations, which make it rather unsafe for a practitioner to rely upon the dicta of this author.

A TREATISE ON

THE HUMAN EAR.

BOOK I.

ANATOMY, PHYSIOLOGY, AND COPHOSIS.

CHAPTER I.

ANATOMY OF THE HUMAN EAR.

The usual anatomical division of this organ, is that which separates it into External, Middle, and Internal.

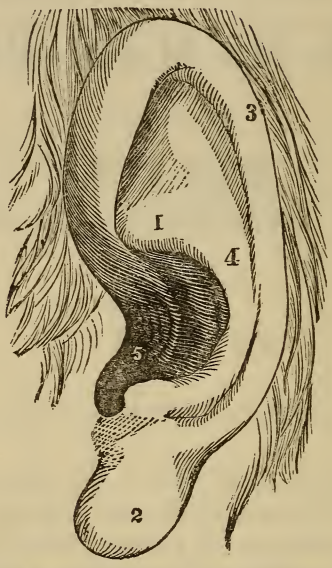
The external embraces the auricle, which is divided into the lobus and pinna, together with the meatus auditorius externus, which extends from the auricle to the membrana tympani: the latter being sometimes arranged with the middle Ear. We will follow the latter arrangement.

The whole organ is situated *on* and *in* the temporal bones on each side of the head—

External Ear.—The soft portion which is pendulous from the pinna is termed the lobe of the Ear; and is composed almost entirely of adipose tissue covered with the ordinary integument. It is not very sensitive, and after moderate pressure for a moment between the fingers, may be readily perforated with a knitting needle or perforator for the purpose of introducing a thread

preparatory to wearing ornaments, or to keep up an irritation for the relief of sore eyes.

Fig 1.



1. Pinna.—2. Lobus.—3. Helix.— 4. Anti-helix.—5. Concha.

All above the lobe is called the pinna, from its resemblance to a certain shell of that name. The outer scroll, commencing on the anterior margin and terminating posteriorly, and at the lobe, is called the helix. The next ridge on the outer surface of the ear, which commences forwards by two elevated lines and terminates below and posteriorly in the anti-tragus, is termed the anti-helix. The little space between the anterior double elevated lines of this ridge, is the scapha: while the general cavity which is surrounded by the anti-helix, and in whose centre we find the external orifice of the outer meatus, is the concha.

Anterior and out from the concha and meatus, we see a little cartilaginous projection which, from its having sometimes short rough hairs projecting from it, like those of a goat, is termed the tragus—and a similar projection posteriorly is the anti-tragus. The orifice of the external meatus is not unfrequently garnished with hairs, which may be long and bristling. The dorsal projections and depressions of the auricle, correspond to the depressions and elevations of the ventral portion, and the whole auricle is attached to the margin of the *bony* meatus by ligamentous union—the cartilaginous portion extending into the canal from a quarter to half an inch.

Three ligaments bind the auricle to the temporal bone—the anterior, superior, and posterior.

Three muscles are also found connecting the auricle to the skull, which in some individuals are under the control of the will, and will move the ear in three several directions, viz :—upwards—the attollens auris—backwards—the retrahens auris —and forwards, the attrahens auris.

The meatus auditorius externus is from an inch to an inch and a half long in the adult, and much shorter in the child and fœtus. About midway it is moderately curved, (according to some at an angle of forty-five degrees,) forwards, inwards, and downwards, so that to straighten the passage, and thus bring the membrana tympani in the line of vision, it is necessary to draw the auricle upwards and backwards. This canal contains the following structures.—1. Numerous short hairs at its entrance. —2. Ceruminous follicles, which secrete a waxy matter soluble (according to Buchanan) in water.—3. The ordinary integument of the ear modified.—4. Areolar tissue which may be denominated subcuticular.—5. Periosteum.—6. Bone and cartilage. The cartilaginous portion forms about half of the meatus, but does not make a complete tube, on account of its division into several distinct portions: these possess some motion on them-

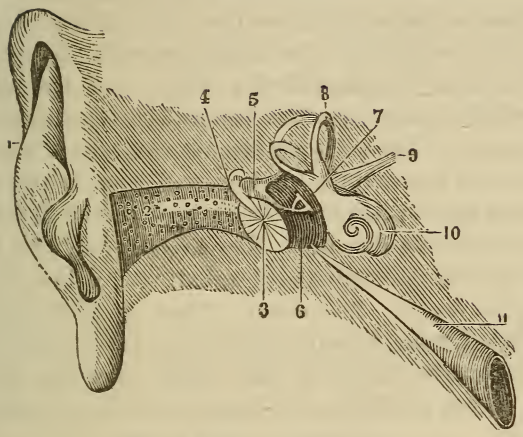
selves. The upper and outer part is deficient in cartilage : its place being supplied by a dense fibrous structure. The bony part of the canal, to which the cartilaginous is attached, by condensed areolar tissue, is termed the processus auditivus of the temporal bone. This, in the fœtus, is a mere bony ring, and becomes more developed in after life. It is consequently deeper in old age than at any other period.

In addition to the hairy development, which is found chiefly in the outer third of this tube, we have in the same locality, the above named ceruminous follicles—which secrete a thick, yellowish, viscid, inflammable, bitter substance : it contains oily fat, albumen, coloring matter and a peculiar animal matter. It is found to be offensive to insects, and probably prevents the passage from becoming too dry, a certain degree of moisture being necessary, not only to the healthy condition of the epidermoid tissue lining the canal, but to that of the membrana tympani itself.

It is supposed by Richerand, that the act of opening the mouth in listening attentively, has the effect to enlarge the meatus, and thus allow the entrance of an increased number of sonorous vibrations.

Middle Ear. The tympanum is a cavity found in the outer and posterior part of the petrous portion of the temporal bone, somewhat irregular in shape—rather the widest in its antero-posterior diameter, which is about half an inch in extent. The smallest width being transverse. It is bounded externally by the membrana tympani, internally by a thin osseous plate, which is perforated by two foramina, the fenestra ovalis, and the fenestra rotunda. An anterior canal, termed the Eustachian tube, communicates with the pharynx—and a posterior foramen with the mastoid cells. It is lined by a continuation of the mucous membrane of the pharynx, which also extends to the mastoid cells.

Fig. 2.



EXTERNAL, MIDDLE, AND INTERNAL EAR.

1. Auricle.—2. Meatus Auditorius Externus.—3 Membrana Tympani.—4. Malleus.—5. Incus.—6. Tympanum.—7. Stapes.—8. Semi-circular Canals.—9. Portio Mollis (auditory nerve.)—10. Cochlea.—11. Eustachian tube.

Membrana Tympani. A bony ring in the pars petrosa of the temporal bone, which forms the boundary between the auditory canal and the tympanum, gives attachment to the margin of this membrane. The latter is ovoid, the broader portion being above and backwards, while the narrower part is below, forward and downward. The outer surface forms with the floor of the auditory canal, an angle of about forty-five degrees—being inclined inwards and downwards. The outer surface is also convave a little below the centre, caused by the handle of the malleus drawing it inwards. Its color is a silvery brightness more or less, in a healthy state. Its structure according to Dr. Toynbee is as follows,

1. The external epidermoid layer.
2. The internal or mucous layer.
3. The middle layer—which he says is composed of two

classes of fibres.—1. Cellular.—2. Radiating.—He describes the lamina of radiating fibres, the outer surface of which is covered by the epidermis, as continuous with the periosteum of the external meatus, with the exception of the uppermost layers, which being somewhat flaccid, have been termed membrana flaccida. The radiating layer is composed of fibres which extend from the circular cartilaginous ring to the malleus, interlacing with each other. These fibres are from 4 to 5,000 parts of an inch in diameter. The circular fibres are firm and strong towards the circumference, but very much attenuated towards the centre. The circular fibres are also smaller than the radiating, being from 6 to 10,900 parts of an inch in diameter. The great density of these fibres, with the absence of distinct nuclei, he thinks are adverse to the idea of their being muscular.

Circulation of the Membrana Tympani.—This consists in the stylo-mastoid branch of the auricular artery, and the ramus tympanicus of the internal maxillary, which forms an arterial circle around the osseous margin, analagous to that around the iris, from which small branches run to the centre.

Nerves.—The tympanic plexus is supplied probably chiefly from the chorda tympani.

The membrana tympani receives the vibrations of the air and transmits them to the bony chain, and to the air in the tympanum.

The tympanum is made irregular on the inner and posterior surface, by the promonitory, which is a projection of bone indicative of the situation of the commencement of the scala tympani. It is found between the fenestra rotunda and the fenestra ovalis, the latter being posterior and the former anterior to it. Its surface is grooved for the passage of nervous filaments, termed the tympanic plexus. Both these fenestræ are subtended by membranes—the oval foramen, by the membrane of the sacculus

elipticus which lines the vestibule, and the round foramen, by a membrane connected with the cochlea. The oval orifice is covered in life by the base of the stapes, one of the small bones.

The eminentia pyramidalis is an irregular little cone of bone, on the posterior wall of the tympanum, which is perforated for the passage of a small muscle, called the stapedius.

"Around the superior and posterior margins of the cavity, a slight elevation forms the wall of the aquæductus fallopii, and marks its course; a small opening, the apertura chordæ, leads from it, behind and below the pyramid, giving passage to the chorda tympani."

The Mastoid Cells.—One large orifice or several small ones communicate between these cells and the tympanum. The enlargement of the ordinary deploic structure results in the formation of these cells, which are lined by the same membrane which lines the cavity of the tympanum

The Eustachian Tube.—A small aperture in the lower and fore part of the tympanum is the commencement of this tube, which proceeds downwards, inwards and forwards, and opens into the upper posterior and lateral parts of the pharynx a little above the level of the floor of the nostril, and about an inch back of the posterior opening. This tube is from an inch to an inch and a half long. The opening into the pharynx is enlarged, forms an oblique slit, and is guarded by a cartilaginous ring which tends to retain any solid body introduced. The tympanic portion is osseous and composed of the irregular extremity of the pars petrosa of the temporal bone, with a portion of the ala and root of the pteregoid process of the sphenoid bone. "Along the superior edge of the osseous portion of the Eustachian tube is a canal, separated from the tube, partly by bone and partly by a fibrous membrane, transmitting the tensor tympani; the extremity of the canal forms a pulley, around which the tendon of the muscle plays, and is thus directed towards the malleus."

(Pilcher.) The whole tube is lined by a continuation of the mucous membrane of the pharynx and the tympanum. The ordinary mucous follicles are abundant in it. The uses of this tube appear to be: first, to admit air to the tympanum; second, to afford ready exit to the secretions of the latter cavity into the throat.

The bones of the ear are four in number, in the young subject, and three in the adult; termed malleus or hammer, incus or anvil, orbiculare or round bone, and stapes or stirrup. They are named from their resemblance to these objects.

The malleus is divided into a caput, cervex, processus gracilis, processus brevis, and manubrium.

The manubrium or handle is inserted between the layers of the membrana tympani. It tapers towards the point, which latter, however, is a little enlarged and turned outwards.

The short process is thick and strong and projects outwards, forming a right angle with the manubrium, bearing a deep depression between itself and the neck.

The long or thin process is rarely separated from the skull in a perfect state. It proceeds forwards and downwards, the point being attached to the inner margin of the tympanic ring, close to the fissura glasseri.

The neck by which these processes are attached to the head, is short and marked by the attachment of muscles and ligaments.

The head forms the superior part, rises above the membrana tympani, and projects into what has been termed the tympanic sinus. It is, on the upper and outer part, convex and smooth, concave on its inner and posterior portion, which is divided into two parts by a transverse ridge, and articulated to the upper surface of the incus.

The anvil has a body and two limbs. The body is nearly square and flat, concave superiorly, and elevated to correspond

to the depressions on the head of the malleus, forming in this way a double pulley joint. The smaller crus projects nearly directly backwards, and is united to the edge of the mastoid cells by a well marked ligament. The long crus hangs downwards, diverging from the manubrium of the malleus. Its extremity is moderately enlarged for the articulation with the round bone.

The os orbiculare or lenticulare is found distinct, in infancy, but becomes united to the long crus of the incus or the head of the stapes, in adult life. It is a mere particle of bone, about the size of a large pin-head.

Fig 3.

BONES OF THE EAR.

Malleus.—2. Incus.—3. Orbiculare.—4. Stapes.

The stapes is so called from its marked resemblance to the ordinary saddle stirrup. Its is divided into a head, neck, two crura and a base. This division is perhaps a sufficient description, except to add that the posterior crus is the longer of the two—that the base or foot is placed in contact with the membrane inside the fenestra ovalis—nearly in a horizontal direction, being a little smaller than this foramen, and that the space between the crura is subtended by a ligament denominated the triangular.

Another ligament which unites the short crus of the incus to the edge of the mastoid cells, with certain duplicatures of the mucous membrane form what are termed the ligaments of the tympanum. The three following muscles, are perhaps all

that can be clearly demonstrated as connected with this chain of bones.

1. *Tensor Tympani or Internus Mallei.*—This arises from the superior portion of the Eustachian tube and from the edge of the petrous bone. It runs backwards into the tympanum, winding round by means of its tendon over the edge of the tube, to be attached to the inner surface of the manubrium of the malleus, near the long process. It in this way forms a very complete pulley. *Use*, to draw the bone inwards, and thus increase the internal convexity of the membrana tympani.

2. *Laxator Tympani.*—This muscle originates in the spinous process of the sphenoid bone, runs inwards and backwards through the fissure of the glenoid cavity, and is inserted by means of a long tendon into the long process of the malleus. *Use*, to draw the malleus outwards and a little forwards, relaxing the membrana tympani.

3. *The Stapedius.*—Arises from one of the mastoid cells and the interior of the eminentia pyramidalis, passing through the canal of the pyramid. Inserted tendonous into the posterior portion of the neck of the stapes. *Use*—to move the stapes backwards, turning its posterior edge towards the fenestra ovalis, thus increasing its tension.

"The exact influence the muscles of the tympanum exert, in regulating the vibrations of the membrane and the bones, is not ascertained. The general opinion is that they are voluntary, being supplied with nerves from the portio dura; and that the membrana tympani is tightened or relaxed at will, as the sound may be pleasing or discordant. More correct observations however show, that they all, and particularly the tensor tympani, receive especial branches from the ottic ganglion, besides twigs from the tympanic plexus, and thus they may be supposed to be involuntary, and to be acted upon sympathetically, through the medium of nervous connection with the portio mollis:

resembling the influence of the retina upon the muscular fibres of the iris. This forms an interesting problem for solution. Probably both opinions are correct; as the muscles are supplied from the two sources,—from the voluntary system by the portio dura, and from the ganglionic by the chorda tympani, and the ottic ganglion. Is it not probable that they may be of the mixed character, acting involuntarily when the acoustic nerve is over-excited, or when the mind is otherwise engaged, and attention not directed to the protection of the membrane and of the ear in general; and being influenced by volition, when the individual is desirous to increase or to diminish his mental perception?" (Pilcher, p. 60.)

Internal Ear, or the Labyrinth.—The internal ear may also be divided into three portions—viz, the cochlea, vestibule and semi-circular canals. Another division, is into the osseous and membranous labyrinths—the first includes the vestibule, semi-circular canals and cochlea—or the bones of the two first, and the whole structure of the latter.

The Cochlea.—Its resemblance to a snail's shell has induced this name. Their being two cavities however instead of one, the analogy is only in external form. It is twice and a half turned upon itself, having a base and point. This arrangement varies somewhat in the ears of the higher classes of animals:—for instance, in the porcupine, it has three and a half spiral turns; in the dog and fox three turns; in man, the cow, hog and cat, two and a half turns; in the horse and dolphin, two and a quarter; and in the rabbit two turns. Birds occupy the last place in the series.—(*Dr. Ch. L. Esser, Hastner's Archives, für aie ges. Naturlehre, tom.* xii., 1 *er. Cah;* 1827, p. 52.) An axis termed the modiolus, from its resemblance to the nave of a wheel—infundibulum, cupola, lamina spiralis, hamulus cochleæ, canalis scalarum communis, and the zona cochleæ, compose the cochlea.

The modiolus is the central pillar, which is hollow for the transmission of the branch of the portio mollis which supplies the cochlea—lateral perforations allow the nervous ramuscules to pass over the surfaces of the zonæ and scalæ cochleæ. The infundibulum is an inverted conical cavity at the upper end of the cochlea, while the cupola is the dome which surmounts this cavity. The lamina spiralis doubles twice and a half upon itself, and passes round the modiolus. The hamulus cochleæ is a small hook, forming the terminal point of the lamina spiralis above. The two canals meet at the upper end of the cochlea under the cupola, and unite, thus forming but one canal, which begins in the vestibule there termed scala vestibuli, and terminates in the tympanum at the foramen rotundum, and there termed scala tympani. The zona is the cartilaginous or membranous portion, which forms the outer border of the bony portion or lamina spiralis. On the surfaces of both this and the lamina, are distributed the nervous loops, which approach them through the cribriform orifices in the modiolus.

Three small orifices connect the interior of the cochlea, vestibule and the bony structure of the pars petrosa, with the exterior surface. These are termed, from an erroneous opinion as to their functions, aquæducts. They are designed to be the media of conducting nerves, bloodvessels, and perhaps some other tissues through the bone.

Aquæductus Cochleæ.—This duct proceeds from the scala tympani, near the fenestra rotunda, backwards, under the labyrinth, and perforating the bone, terminates by an irregular opening on the lower margin of the posterior surface of the petrous portion. Several smaller canals communicate with it from the cancelli, in its course.

Aquæductus Vestibuli.—Originates near the common orifice of the superior and posterior semi-circular canals, perforates the bone, and descends to the posterior surface of the pars

petrosa near the jugular fossa. By some it has been traced to the scala vestibuli.

Aquæductus Fallopii.—This canal whose function is merely the transmission of the portio dura nerve, commences at the upper and inner part of the meatus auditorius internus, and passes outwards, at first a little upwards and forwards, then backwards and downwards, and finally almost directly downwards to the foramen stylo-mastoideum where it terminates. At the beginning of it, or near its course, it receives the hiatus Fallopii, a narrow canal on the dorsum of the petrous portion of the temporal bone, which conducts the vidian nerve to the portio dura. Several other small orifices open into it, which transmit the chorda tympani and other branches to the tympanum.

Meatus Auditorius Internus.—This is found on the posterior surface of the petrous portion of the temporal bone, and is a large canal for the transmission of the portio mollis, portio dura, portio intermedia and internal auditory artery to the interior of the bone. It is about half an inch in length—passing outwards and forwards; and at its outer extremity or bottom, terminates, in a cribriform plate which is divided by a well marked transverse ridge. In the upper and smaller portions we have the commencement as above described, of the aquæductus Fallopii. Posteriorly, foramina transmit fibres of the portio mollis to the superior semi-circular canal. The lower or larger portion is divided into two parts, the anterior of which forms the base of the modiolus, and has a distinctly cribriform arrangement, the orifices being in circles one within another, with a large central orifice. The nerves which pass through this bone pass through the modiolus, and are distributed to the cochlea. They are branches also of the portio mollis. Through the posterior division of the bone, other branches, from the same, pass to the vestibule and to the ampulla of the posterior

canal. The whole meatus is lined by dura mater. An internal periosteum lines the whole of the labyrinth, and has the portio mollis finely distributed over it. It also secretes the perilymph, or that fluid which is outside of the membranous sacks which are found in the vestibule and semi-circular canals.

The semi-circular canals, are three in number, superior, external and inferior. They are solid bone, and communicate with the vestibule.

The membranous labyrinth consists in sacks which do not entirely fill these canals and the vestibule, and contain a clear fluid, like water, called liquor Cotunnii. The vestibular portion is said by some to contain two sacks; the larger and posterior is termed the sacculus vestibuli. The semi-circular canals all open into this, some by their expanded extremities, termed ampullæ. The anterior sack is smaller and called alveus utriculosus. Brachet and Roget describe, in each of these sacks, a white, calcareous body, which seems to be suspended by means of filaments of the acoustic nerve.

The nerves of the ear are,

1. The *Auditory*, as above described, in its distribution to both the solid and fluid portions of the ear;

2. *Portio Dura or Facial Nerve.*—It passes from the internal meatus, along the canal of Fallopius, until it reaches the stylo-mastoid foramen, where it emerges to the parotid gland, and thence to the face forming the pes anserinus.

"The facial in its course through the bone gives a good sized twig to the tensor tympani, part of which reaches the Eustachian tube, then a filament or two to the tympanic plexus; then a branch to the stapedius; and, lastly, near the termination of the aquæduct, the vidian nerve leaves it under the name of chorda tympani."

3. The vidian nerve enters the cranium through the pterygoid foramen, then the hiatus Fallopii passing off from the portio

dura as above described, it passes across the tympanum between the long crus of the incus and the handle of the malleus; then enters and emerges from the fissura glasseri, unites with the true gustatory and passes to communicate with the submaxillary ganglion. In its course it communicates with—1. The sympathetic in the carotid canal.—2. With the portio dura.—3. The tympanic plexus receives twigs from it.—4. The laxator tympani.—5. The ottic ganglion.—6. The gustatory, and 7. The submaxillary ganglion.

The ottic ganglion, as described by Arnold, "is a small, soft, reddish body, larger in proportion in the fœtus, situated immediately below the foramen ovale: it rests on the inner surface of the third branch of the fifth, between it and the Eustachian tube, and immediately in front of the great meningeal artery."

The Tympanic Plexus.—According to Jacobson it is situated near the promontory of the tympanum, and is formed by the union of twigs from the sympathetic nerve, ottic ganglion, chorda tympani, portio dura, and glosso-pharyngeus. The mucous membrane of the tympanum, Eustachian tube and the muscles, &c. of this cavity are supplied by it.

The ear is supplied with blood, by branches from the carotid and basilar arteries.

The posterior aural, arises from the external carotid, and is distributed to the external ear. It gives off the stylo-mastoid branch, which passes through the foramen of the same name. This branch afterwards divides into numerous ramuscules which are distributed to the mastoid cells, labyrinth, and with a branch from the internal carotid termed the ramus tympanicus, forms a coronet around the membrana tympani, which sends branches towards the centre, like that around the iris.

The anterior aural arteries, are supplied by the temporal. The tympanic passes through the fissura glasseri, and is distributed to the coronet as above stated. The internal auditory

arises from the basilar, and runs along the under margin of the portio mollis outwards, supplying this nerve in its course, and passing with its ramifications to the various portions of the labyrinth.

The veins and lymphatics correspond to, and are distributed with the arteries.

CHAPTER II.

PHYSIOLOGY OF THE EAR.

It is clearly demonstrable, that there enter into the structure and functions of the ear, at least three distinct forms of matter—viz: gases, fluids and solids: and that it is by an union of the acoustic proportions of these, that complete, or normal hearing is accomplished. The auricle and meatus auditorious externus, are beautifully adapted, to concentrate the sonorous vibrations of the atmosphere, and direct them in the most forcible manner to the membrana tympani. This membrane, receiving probably the vibrations both from the meatus and tympanum, vibrates and communicates the vibrations through the manubrium of the malleus, to the four bones which form a solid connection between the membrana tympani and the vestibule. The base of the stapes transmits through the foramen ovale, and its subtending membrane, those vibrations, which are thence conducted through the vestibule and semi-circular canals, by means of the liquor cotunnii. The atmospheric air, the bones and membranes, and the liquor cotunnii, are the three media, gaseous, solid and fluid, which conduct sonorous vibrations to the acoustic nerve, distributed to the semi-circular canals and vestibule.

The cochlea on the other hand appears to be almost exclusively solid; and whether the vibrations be communicated to

it through the general skeleton or from the tympanum, through the foramen rotundum, by means of the atmospheric air; still the receptacle of sound is solid, being both bony and cartilaginous.

The relative value of these several media may be learned from the fact, that sonorous vibrations set in motion in atmospheric air, at medium temperatures, and barometric pressure, move with the velocity of 1,142 feet per second; while in water and fluids of the density of water, they pass at the rate of 4,708 feet per second; and in iron and hard wood, the velocity is increased to 18,530 feet per second. In all these cases, the conducting power is diminished, by diminishing the density of the medium, and vice versâ. At the top of high mountains, where the density of the atmosphere is very considerably diminished, it is said that the sound of a pistol is scarcely greater than that of a fire-cracker; in vacuo also the sound of a bell is entirely lost. In clear weather, when the barometer indicates a heavy or dense atmosphere, sound is communicated much further, and is heard better. When air is condensed artificially, also, the sound will be found to increase with the condensation.

The laws of vibrating bodies are very interesting, and well worthy the attention of the physiologist and scientific surgeon. It is found for instance, that tense strings and membranes vibrate in sections, between which, there are points termed nodal points, where little or no motion is observed. A vibrating string thus divides itself into a number of sections with corresponding nodal or stationary points. The position in the musical scale of Guido, of these notes depends on several circumstances.—1. The length of the string vibrating.—2. The velocity of the vibrations.—3. The size of the string; and 4. its density: the latter property being affected as is well known, by its dryness or moisture. Almost the same laws

exist in reference to distended membranes, in a state of vibration. In the latter cases, as in drum-heads, tamborines, &c., the nodal points may be demonstrated; by placing sand on them, and then causing them to vibrate. The sand will assume various geometrical figures whose lines will indicate the nodal surfaces.

It is said that engineers, by placing a drum on the ground, with a small quantity of sand upon it, are enabled to detect the act of mining although no sound can be perceived in any other way, simply by the motions of the particles of sand, induced by the vibrations communicated to the drum head from the earth.

The difference between the conducting and the reflecting powers of bodies, is as distinct, in reference to sound as it is in reference to light. The angle at which vibrations of air, thrown off from surfaces on which they are made to fall, like that of rays of light, under the same conditions, is equal to that of incidence. On this simple law are based the curious phenomena of echos, sounding boards in churches and other edifices, as well as those of whispering galleries. In the latter case, a complete circle, with a continuous smooth surface, appears to be essential to their perfection. Arches and domes collect and multiply waves of vibrations, in a manner to interfere, often, with that purity of sound, in the human voice, so necessary in school houses, churches and other public buildings. The writer has been informed that the arched arrangement of the chambers in the Girard college, near our city, precludes the possibility of using them for purposes of instruction, until the domes are destroyed by means of transverse horizontal partitions. On the other hand a number of rough and irregular surfaces, absorb sound, so that a room filled with an audience, or lined with angular pillars, is much more difficult to fill with sound than an empty one, and one whose surfaces are less broken. A continuous smooth surface, as that of a high wall,

the surface of calm water, or of ice, is very favorable to the preservation of sound. Battles fought at sea, when the latter is calm, as well as those on land, have been heard at a distance of two hundred miles and more.

Two circumstances co-operate to produce this result:—the reaction between the vibrating air, and the smooth surface (the latter doubtless vibrating with the air, even that of the most solid walls;) and the preservation or reflection of the sound, without absorption, along the smooth surface. The same laws are operative, in cases of speaking trumpets and tubes. In the former case, the vibrations of the metal, with the gradual enlargement of the vibrating surface, and consequent increase of the amount of air acted upon, multiply very much the force and numbers of the vibrations. When these are directed against any smooth surface, as the expanded sail of a vessel at sea; the side of a hill or a high wall—the sound collected at a focal point will be much greater than could be produced by the human voice alone, directed to that point. Speaking tubes have the advantage of not losing their vibrations, rapidly, in the atmosphere—hence the sound, reflected from one side to the other of the tube, is augmented by the vibrations of the tube itself. Sound is thus actually increased in its passage along these conductors. This principle is doubtless operative in the meatus auditorius externus, which may be considered in the light of a speaking trumpet. The bent form of the tube (an angle of forty-five degrees) does not affect materially this augmentation of sound. The whole tube, there can be but little doubt, both the bony and cartilaginous portions, vibrates under these circumstances; like the parieties of a speaking trumpet. The structure of the membrana tympani is well calculated to fit it for the reception of the vibrations, thus conducted to it. Its extreme tenuity, with the peculiar arrangement of its fibres; and the somewhat relaxed conditions in which it is usually found,

predispose it to take on a vibratory motion with great facility. The principle so well known in musical instruments, called sympathy, by which, one body, in a state of quiescence in the vicinity of another, in a state of vibration, (of the same tone) sympathises or vibrates in harmony with the latter; may exist in the membrana tympani as well as in other vibrating bodies. The thickening of this membrane from inflammation, or the presence of some foreign substance in contact with either of its surfaces, must necessarily affect these fine functions very much. Query? how much of the musical ear depends upon the material condition of the membrana tympani? Its vibrations in unison with the finer and higher sounds of musical instruments, must assist very much in the appreciation of these sounds, especially when the cerebral or mental organization is musical. It is well known that tension and relaxation of this membrane are not only the result of the presence and absence of moisture: but are produced by the movements of the oscicula auditûs: which are indeed more or less under the control of the will. The vibrations of the membrane are communicated to this chain of bones through the manubrium or handle of the malleus, and little time is lost in conducting it to the fenestra ovalis; where from the solid bones it is transmitted through another membrane to a fluid, the liquor cotunnii. This fluid is arranged in the form of three circular arches, which begin and terminate, in a general fluid distributed in two sacks—in the vestibule. The arches are semi-circular canals, which are bony. The vibrations of the fluid arches, it may be supposed, are communicated to the bony, or solid tubes, in which they are enclosed. The vibrations return to the vestibule multiplied probably, in the same way, that sound is multiplied in the atmosphere under like circumstances. In addition to this arrangement two osicula are suspended in the two sacks, in the vestibule, perhaps by nervous filaments of the seventh pair or portio mollis, which is also

distributed to the internal periosteum of the bony canals and vestibule. The vibrations, thus reach the expanded extremities of the nerve, much augmented in force and intensity; and the impression is transmitted to the brain. Where does perception take place; at the root of the nerve, or at its expanded extremity?

The physiology of the cochlea, is perhaps more obscure. The foramen rotundum may transmit vibrations from the tympanum, particularly those received through the Eustachian tube, to the scala tympani; which conducting them to the cupola or apex, enables them to pass down again through the scala vestibuli to where the latter opens into the vestibule. They may here, join with, confirm or multiply vibrations already received through the oscicula and foramen ovale. In the mean time, however, the nervous loops, distributed over the surface of the scala membranacea may be recipients of the impressions, and transmit them directly to the brain. This must be the case where from disease or other defect in the semi-circular canals and vestibule, impressions are not communicated in that direction.

Webber, of Germany, considers the cochlea as the representative, in man, of the auditory apparatus of the fish, whose oscicula are merely placed in a bony cavity, and communicate sonorous vibrations to the brain, simply as solids. It seems very probable, that sounds transmitted to the brain through the solids of the body alone (such for instance as those produced by a watch held between the teeth, the jar of a floor or partition with which some part of the body comes in contact) are perceived by means of that portion of the auditory nerve, which is expanded over the interior of the cochlea.

It is probable also, that after the loss of the membrana tympani and oscicula, the vibrations of the atmosphere are communicated through the foramen rotundum, and that the perforation of the membrane, is for this reason, followed in some cases by improved hearing.

In reference to the uses of the mastoid cells, it is probable that they merely serve the purpose of increasing the force of the reverberations of the air. The amount of air in the tympanum is, as it were, increased by the additional space of these cells. The temperature, pressure, and sonorous vibrations, are thus preserved, and perhaps improved. Sudden rarefaction or compression of the air, as well as variations in its temperature, &c., are thus also more effectually guarded against. The uniformity of the existence of these cells, particularly in the mammalia and birds, proves their utility. In many animals they are directly connected with the tympanum, and indeed form a part of it. In birds also, they are extended to the bones.

They doubtless, in the human subject, act as sounding boards: and increase the force of the vibrations of the air in the tympanum.

The speculations of Sir Charles Bell and others, in reference to the musical ear, placing this latter faculty in the membrana tympani, or in other parts of the ear are probably imaginary.

Good hearing, accompanied with the power (cerebral or mental) of appreciating musical sounds or harmony; are the requisites for the full development of the musical ear. It is well known that neither the talent or taste for music is lost, with the loss of any portion, or all of the structure of the ear. It is probable therefore that the talent is mental—and to a certain extent independent of the organ of hearing. Yet, that the faculty should exist without the corresponding organ, would be an anomaly in that harmony which is so universally observed throughout the works of nature.

CHAPTER III.

COPHOSIS.

THE causes of defective hearing, in all its varieties may be arranged under the following heads.

1. *Loss of the Auricle.*—The use of the auricle, is doubtless, that of collecting the sonorous vibrations of the air, and concentrating them upon the external meatus, and through this, on the membrana tympani. The vibrations of the cartilaginous structure (the pinna) may also assist in transmitting sound to the tympanum. The loss, therefore, of the auricle, by accident or disease, will be followed by more or less imperfection in the function of hearing. This is not so great as many have supposed; and no relation has as yet been established, between the size of the auricle and the acuteness of audition The author, was acquainted some years ago, with a young man, who had had the right auricle shaved off by the wheel of a rail-road car. In him, the dulness of hearing which followed was very slight.

It is well known, that timid animals, such as the hare, the rabbit, the llama and others whose safety from the voracity of other animals, is in flight, and whose hearing, must be acute, in order to warn them of approaching danger, have large and moveable ears. The ass, on the other hand, proverbial for the size of his aural appendages, has not as we are aware of been charged

with cowardice; or remarkable acute hearing; the more docile dogs—the King Charles' Spaniel, for instance, have long and pendulous ears; so also the fox-hound; while the fox, the terrier and the bull-dog have short ears. Whether, in the human subject the auricle diminishes or not, in proportion to the increase or advancement in civilization, as is supposed by some, is not decided. Byron says, he was recognized as belonging to the aristocracy by a Turkish officer, by his small ears. We know very well that the inhabitants of the south sea islands, pride themselves on the size of their ears, and take great pains to enlarge them by perforating the lobe and dilating it, gradually with pieces of wood—until at last a large sized block is introduced and habitually worn as an ornament.

Any obstruction in the meatus auditorius externus must impede the passage of air to the membrane. These obstructions, are:—

1. Congenital deficiencies, complete or incomplete. A case is recorded of a negress in Virginia, who had a congenital deficiency of the auricle and meatus of both ears, but who could, however, hold conversation with her fellows very well. In order to hear what was said to her, she opened her mouth and turned her face toward the speaker. She could hear nothing or very little with her mouth shut.

2. Foreign bodies in the meatus. Cases continually occur in which foreign bodies are found embedded in the passage, and have remained there for many years. Independently of the irritation which they produce in the neighbouring tissues, they necessarily produce more or less deafness. Cherry pits, grains of corn, pebbles and pieces of wood and small buttons, are the substances usually found there.

3. The accumulation of an inordinate amount of the cerumen of the part. This is a very common occurrence. The writer has seen many cases where the patient has remained months

and sometimes years, nearly deaf on account of these collections. Accurate examination of the passage should in all cases of deafness, be made with a strong light, and the ear speculum.

4. Polypi and other morbid growths, which take place from the membrana tympani, or from the parieties of the meatus. These are generally attended with chronic purulent or mucous discharges.

III. Derangements of the membrana tympani. Leaving out all inflammations, acute, chronic, or specific, which affect the hearing very much during their progress, the following conditions also affect it much. 1. Thickening of the membrane. The color of this tissue, as has elsewhere been stated, is a very light pearl or milk and water color, somewhat diaphanous. When thickened it becomes chalk-white, or yellowish white, and is in a condition in which it is indisposed to vibrate as a membrane. The character of a slightly tense membrane is lost, and instead of vibrating like a moderately tense sail, with each wave of air, on either side, it becomes a more or less solid wall, whose vibrations are much more difficult to induce. This is the cause of a deafness in one ear, frequently the right one, which so many labor under after chronic otorrhea in childhood, which has been neglected. In some cases, especially in young persons, and where there is no scrofulous tendency, this thickening of the membrane is removed by absorption—generally, however, it remains during life. 2. Calcareous or osseous deposits, on or in the structure of the membrane.—These are found sometimes in old persons and persons of a peculiar diathesis. A complete wall is thus formed, which presents a barrier to the introduction of sound through the external meatus. 3. Polypous growths, upon the membrane, which are accompanied with thickening of its tissues, and sometimes totally obstruct its natural vibrations. 4. Partial or complete loss of the membrane. Perforations of the tunics, partial or complete, are the not

uncommon results of inflammation and injuries. The membrane may be merely perforated or partially destroyed; the remainder being attached to the manubrium of the malleus, or to the bony ring around. In this way the defective and relaxed condition of the membrane, or its entire absence may be the cause of deafness. In some of these cases, it is probable that the use of glycerine or some analagous substance, by supplying to a certain extent the vibrating properties of the membrane, would be useful. These are probably the cases which, as reported by the English surgeons, were so wonderfully relieved, and that at once by the use of moistened cotton, glycerine, &c. A very common experiment to detect these conditions of the membrane, the exhalation of smoke, through the Eustachian tubes, by filling the throat with smoke—closing the nose and mouth forcibly, and attempting to "blow out" the smoke. It finds its way out through the tube and meatus, when the membrane is perforated or lost. A much better way is to examine the meatus carefully with the speculum. The loss of the entire membrane, and sometimes that of a part of it, is accompanied with the removal of one or more of the oscicula. It is of some importance, to know, whether they are all destroyed or not. If the stapes remain in situ, as it very frequently does, the diminution of hearing is much less than when it also is gone. The patient may in fact hear tolerably well under the latter circumstances. Where the membrane and the oscicula of both ears have been destroyed, the above fact will explain why one ear retains its function better than the other, as is often the case.

IV. Closure or filling up of the Eustachian tubes, or tympani. The first condition may be either temporary, or permanent. 1. Temporary closures of the Eustachian tube, are often the result of inflammation of the mucous membrane of the throat and fauces, extending to the tube. Ordinary catarrh, scarlet fever, measles, small pox, varioloid and similar diseases, produce this

condition, and leave the patient more or less deaf in one or both ears. The closure may be the result, merely, of the swelling of the lining membrane, or it may be caused by the formation of a mucous plug, which forms by the inspissation of this fluid, in the tube. The opening of the tube, is often indicated to the patient by a sudden snap, in the ear, with an equally sudden increase in the acuteness of hearing. The swelling subsides, and the inspissated mucus is thrown out, thus leaving the passage open. 2. Permanent closures are the results of the same causes, and particularly of chronic inflammation which produces a permanent thickening of the lining membrane, a plug which becomes semiorganized and fixed, or one or more strictures, which close the passage. Congenital closures must also be arranged under this head. Great care should be observed after scarlet fever, measles, catarrhs, &c., to have the passage cleared out, soon after the declension of the disease; otherwise, a more permanent closure results, which will at first be followed by partial, and finally, in many cases, by complete deafness. It would appear that the natural outlet of the tympanum being closed, disease, sooner or later sets in, and perforates the membrana tympani, or involves other portions of the internal ear. As far as the author's experience has gone, these closures of the Eustachian tubes are more certainly followed by lesions, inducing entire cophosis, than any affections of the external meatus, or tympanum itself.

The consequences indicated are the more likely to follow, inasmuch as the tube is somewhat difficult to explore, and also as one tube may be closed for a long time, before the patient or his friends may detect it.

2. The tympanum is sometimes filled with pus, blood, a cheesy matter, fungus or bone. In either case the accompanying deafness is very considerable. Temporary engorgements of the lining mucous membrane, are generally relieved, when the

inflammation which induced them subsides; by the discharge of the effused fluids, through the Eustachian tube into the throat: or, the membrana tympani having bursted, into the meatus auditorius externus. Congenial deficiency is of course a cause of deafness, but is generally associated with other organic defects.

V. Diseases of the labyrinth induce deafness and noises in the ears. These diseases, at least the pathological conditions of the parts, are not very well understood: and are now, in most practical treatises, referred to the nervous expansions of the part. The deafness which accompanies old age is probably in some cases the result of atony of the nerve; in others of ossification of or deposits in portions of the labyrinth.

Atrophy of the portio mollis has been found by Dr. Bock, in the ears of deaf mutes, with other defects in the labyrinth.

It must not be forgotten, that like any other apparatus of the body, one part sympathises with another; and that the organ sympathises with other organs and systems in they economy.

We may have deafness, doubtless, sympathetically induced; by disease existing in other organs, as the brain, stomach, &c., &c.

VI. And lastly the root of the acoustic nerve, or the substance of the brain itself may be the seat of the disease, and the cause of deafness. We may now see the folly of speaking of cophosis, as a disease. It is in all cases, merely a symptom —a very important one it is true, but properly only a symptom; to remove which remedies may be necessary. The publication of cases of deafness cured by this or that favorite remedy, as is so often seen in our medical journals, is little more definite, than that of the most arrant quack. Such publications should be considered rather as appeals to an ignorant public, than to a scientific profession. Let the known or supposed cause, or at

least the known conditions of the parts affected be stated; and we will have some rational data on which to infer the *modus agendi* of agents proposed for our use.

An enlightened empiricism is commendable, and necessary in the present imperfect condition of medical science; but an empiricism which disregards well established truths and known conditions of the organs, can be of little use in forwarding the great object of medicine—the cure of disease. Such publications must be placed in the same category, with Dr. Smith's cough mixture, pulmonic syrups, anti-dyspepsia medicines, hair tonics, acoustic oils, *et id genus omne.*

No classification of the diseases of the ear, with which the author is acquainted, embraces the whole list without many incongruities. This perhaps, in the present state of aural surgery, is unavoidable. The following appears to him, to approach as near to the desired object as any that has yet appeared. It is, as will be seen, based chiefly on the anatomical structure of the parts.

BOOK II.

DISEASES OF THE EAR.

1. Auricle.
   1. Acute inflammation.
   2. Erysipelatous do.
   3. Phlegmonous do.
   4. Furuncle.

2. Meatus Auditorius Externus.
   1. Acute inflammation.
   2. Chronic inflammation without ulceration.
   3. Chronic inflammation with polypi.
   4. Inflammation of the glandular structure.
   5. do. of cellular structure.
   6. do. of periosteum and bone.
   7. Erysipelatous inflammation.
   8. Foreign bodies in the meatus.

3. Membrana Tympani.
   1. Acute inflammation of.
   2. Chronic do. without ulceration.
   3. do. do. with ulceration.
   4. Thickening of the membrane.
   5. Tension and relaxation of, depending upon organic changes, and diseases in the tympanum

4. Tympanum.
   1. Acute inflammation of mucous membrane.
   2. Chronic inflammation.
   3. Mucous engorgement.
   4. Stricture of Eustachian tube.
   5. Impervious do.

5. Labyrinth. Nervous Deafness. Acute. Chronic.

CHAPTER I.

DISEASES OF THE AURICLE.

1. ACUTE inflammation of the auricle.

This structure, at once epidermoid, cellular and cartilaginous, is subject to acute inflammation from any of the ordinary causes, or from the extension of inflammation from the vicinity.

Treatment.—It may be relieved by the ordinary antiphlogistic means, viz:—Cold poultices, cold water, lead water, leeches, &c., &c. Inflammation from frost-bite demands great care to prevent sloughing.

The application of snow, cold water, salt and water, &c., &c., until the parts begin fairly to react, will be found necessary in the beginning. Poultices of flax-seed meal, bread and milk, or a solution of acetate of lead, or even leeches, will be proper when reaction has taken place, and we desire to reduce the resulting inflammation.

2. Erysipelatous inflammation of the auricle.

This disease is sometimes sudden in its attacks; appearing

during a single night. It is characterized by a burning, smarting, or pricking pain in the part, accompanied generally with headache, lassitude and general languor. Symptoms of general fever not unfrequently precede the appearance of the external local symptoms; the "febris erysipelosa" of Hoffman. The cuticle swells up very much, almost obliterating the depressions on the surface of the auricle, and is of a bright red, sometimes of a purplish color.

The inflammation and swelling, will generally extend to the orifice of the meatus auditorius and close it. Accompanying this condition of the parts, the tongue will be furred, especially, after the first or second day, and a dull stupid sleep will be experienced by the patient at night.

The disease generally terminates with proper treatment, in resolution. It must however be always borne in mind, that the disease, as its name imports, is a creeping or traveling disease, and liable to be transferred not only to the meatus, but to the middle or internal ear, or to the brain itself.

It may pass over the scalp, or creep towards and over the face. Fortunately the extent of surface really occupied by the inflammation, does not increase in proportion to the space traveled over—for it dies as it goes.

The several forms of simple, vesicular, phlegmonous, bilious, and gangrenous erysipelas, may take hold of the organ. The most common, is either the simple or the vesicular, which terminates by a general desquamation over the whole inflamed surface, as the disease declines.

Treatment.—It must ever be borne in mind, that erysipelas, in whatever part of the body it is found, is mostly associated with derangement of the digestive functions, and accompanied by more or less general fever.

Mild cathartics—such as Senna and Sulphate of Magnesia, with aniseed—or when the tongue has a dark fur on its surface

—the Compound Cathartic pill: or what is better, a blue mass pill at night, of three grains, followed by a Senna and Sulphate of Magnesia cathartic, each following morning, for three or four nights and mornings in succession, will accomplish our purpose. This object, the cleaning of the tongue and the restoration of the secretions generally, must be attained or the disease will not yield.

The aromatic Spirits of Ammonia, Spts. Mindereri, Acetate of Potash, Spts. Nit; dulcis, or other diaphoretic remedies and drinks, will assist in producing a moist condition of the skin, a soft pulse, &c., &c.

The best local application to the auricle, will be the saturated tincture of Iodine, applied by means of a camel-hair pencil, twice or three times a day. After each application a ground flax-seed or slippery elm poultice will keep the parts moist and relaxed. This local treatment, with the daily or twice a day washing out of the meatus with warm water, by means of a syringe, should be continued until the inflammation subsides. A strong solution of the Nitrate of Silver, (40 to 90 or 80 grains to the ounce of water,) applied to the auricle, every morning, may be resorted to with good success. The objections to the latter remedy are, its blackening the skin and linen of the patient, and the length of time which the color remains on the cuticle. The mahogany color produced by the Iodine, passes off with the cuticle every twenty-four hours; the discoloration produced by the Nitrate of Silver, remains for several days, and sometimes for weeks. We need only add that the meatus must be carefully watched, and frequently washed out with tepid water. If this be not done, the secretions will collect and irritate the parts, producing an otorrhœa which may result in thickening of the membrana tympani, and a greater or lesser amount of deafness.

Case 1.—Mr. D. W. A young merchant, not long married

had been confined to his counting-house, very closely for a length of time, and no doubt at his home, with his young wife; was attacked with head-ache and general languor, which was soon followed by an itching, burning sensation in the right auricle. On examination, I found the whole auricle swelled, of a bright red color, shining and presenting the appearance of well defined erysipelatous inflammation. The tongue was covered with a thick fur, with a dark brown line in the centre. The skin dry; the eyes injected: the pulse excited and no appetite, with slight nausea and constipation. I prescribed the following cathartic R. Sennæ Fol. ℥ss.; Magnes. Sulph. ℥ss.; Sem. Anis. ʒiss.; Add one pint of boiling water, cover, and when cool, take a wine-glassful every half hour, until the bowels are moved. The Tincture of Iodine was applied freely to the inflamed surface, with a camel's-hair pencil, and a poultice of ground Slippery Elm bark applied over the ear.

The diet to be strictly vegetable—such as rice, corn-bread, tea and dry toast, &c. To exclude the air and particularly all currents of air from the part. On the next day, I found the inflammation had somewhat subsided; the Iodine had the effect of alleviating the pain and smarting, and the poultice had relieved the tension of the parts. Directed him to continue the cathartic, taking in the morning, a wine-glassful, and another during the day should the bowels not be moved twice or three times without it.

This treatment, with the simple addition of washing out the meatus carefully with warm water and a syringe, twice a day, was continued for five days. Desquamation of the cuticle took place, the general health was restored, and a deafness, which he had long labored under, in that ear, was not increased. The membrana tympani had not therefore been thickened by the inflammation.

3. The phlegmonous form of the disease, is here as elsewhere,

accompanied with so great an amount of derangement of the system, associated with general debility, that in addition to the local treatment, stimulants and tonics are to be resorted to.

4. Furuncle.—"Preceded by pain of a sharp prickling throbbing, and tearing character, and increased heat, there is formed on a circumscribed spot of the auricle, a red, hard tumor, from the size of a pea to that of a hazel-nut." "This species of inflammation occurs most frequently in the concha, just before the entrance of the meatus, in the scapha, and in the cavitas innominata, in those parts of the auricle which are throughout supplied with cellular membrane, where there is the least of this tissue." (Kramer on the Ear. First edition, p. 79.)

The tendency of this, like most phlegmonous inflammation, is to suppuration. Sooner or later, fluctuation will be perceived and a purulent discharge will follow. The treatment should be directed to promote this termination—poultices and other emollient applications should be applied externally; and anodynes, to relieve the cerebral and other nervous symptoms, should be given internally. General principles will be sufficient to guide the intelligent practitioner in these cases.

The meatus externus and auricle are sometimes affected with an herpetic, ulcerous eruption. It always produces a great thickening of the integuments, and the passage is often so much closed that a great degree of deafness ensues. The ichor, which exudes from the irritated surface, inspissates in the meatus, and not only obstructs the entrance of sound, but is accompanied with a great degree of fœtor. This disease is not unfrequent. I have never seen it resist the effect of alterative medicines, and the use of the applications employed in the following cases.

Case 1. Miss S. F. applied for a complaint in her ear, that had for many months greatly diminished the power of hearing. It proved on examination, to be an herpetic ulcer-

ation of the meatus externus and auricle. The orifice of the meatus was almost closed. With difficulty I introduced the nozzle of a syringe, and brought out a considerable quantity of inspissated discharge. The oozing of the ichor was very great.

"She was perfectly cured at the end of two months by taking two grains of calomel every day; and the injection of a lotion of hydrargyri muriatus cum aqua calcis, and the application of the unguentum hydrargyri nitratis."

Case 2. Mr. R. W. was a similar case, and cured by the same treatment in three weeks. [*Saunders on the Ear, page* 45.]

The above lotion will be found useful generally in herpetic eruptions—especially if they be of a syphilitic character. It is made as follows: ℞. Aquæ Calcis, f℥vi.; Calomel ℥ss. A black precipitate falls, which must be shaken up before using. This is what is commonly called the "black wash."

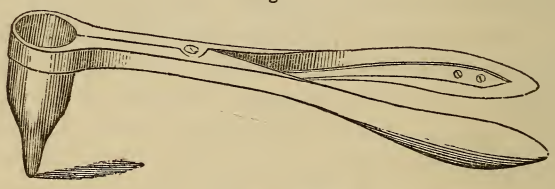
CHAPTER II.

DISEASES OF THE MEATUS AUDITORIUS EXTERNUS.

1. *Acute inflammation of the epidermoid tissue of the meatus.* —Previous to presenting a detailed account of the diseases of this passage and the membrana tympani, it will be proper to speak of the best modes of exploring or examining the parts.

The fact that the passage is somewhat curved, makes it impossible in many cases, particularly in adults, to examine, with the eye, the parietes of the meatus and the membrana tympani

Fig. 4.



SPECULUM AURIS.

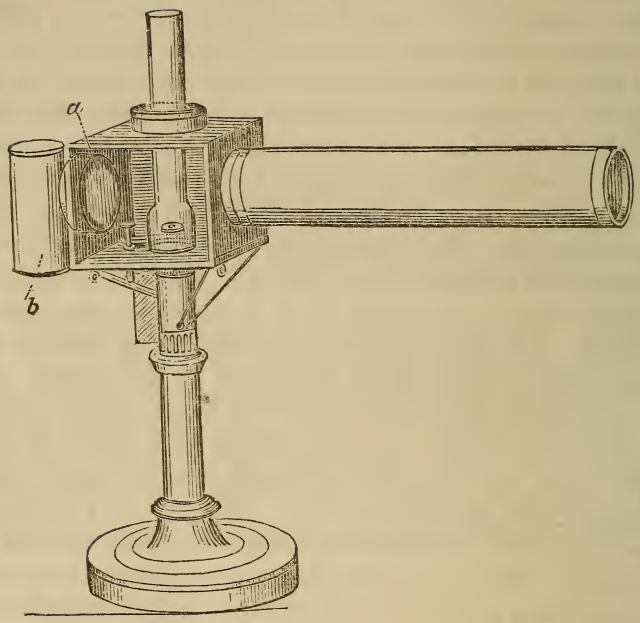
at its farther extremity. The light should be strong; and sunlight is by far the best. This however can seldom be made to fall upon the membrane without straightening the canal by means of a tube termed a speculum. The introduction of a probe, to examine the passage, is not generally advisable, except in cases where it is closed, or partially closed, by some foreign body or morbid growth. The short bristly hairs at the mouth

of the meatus, present also an obstacle to ocular examination. True, we may by directing the auricle towards the sun, pulling it upwards and outwards, drawing the tragus outwards and on one side, and inclining the head of the patient strongly in the opposite direction, see the membrane, in many cases where there is little or no disease; but generally a speculum auris is necessary. Fabricius Hildanus is said to have been the first to invent such an instrument; the arms of which have more or less of a pyramidal form. The accompanying cut will perhaps sufficiently illustrate the speculum auris. [Fig. 4.] The tunnel should be painted black on the inside, so as to reflect as little light as possible. The spring between the handle blades will keep the tunnel closed, while being introduced to the meatus; and pressure on the blades will expand the tunnel, in the passage, to the proper extent. A strong artificial light, should the sunlight not be accessible, may be obtained from an Argand lamp, arranged as in the magic lantern. [Fig. 5.] A gas light, or one or two wax or spermaceti candles are good substitutes for the lamp. There is no excuse in any case, simple or important, for neglecting the use of the speculum; whether the light used be artificial or sunlight.

Inflammations of the meatus are most common in infancy and childhood—the parts becoming less vascular, and consequently less subject to inflammation, as we advance in years. The middle and internal ear is far more subject to disease in the later periods of life.

Acute inflammations occurring from cold, exposure or draughts of air, or from sympathy with inflammation or irritation in other parts, particularly the gums, in young children, and the eyes in older persons, are very liable to pass into the chronic form, and to be accompanied by more or less discharge from the meatus. The cause acts either alternately on one passage and then upon the other, or the action is transferred by sympathy

Fig. 5.



from one ear to the other. For it is found in some cases, that the subsidence of inflammation, in one, is immediately followed by its establishment in the other. The same thing, it is well known, takes place in the eye; and in the latter instance we have several times observed that the pupil of one eye was expanded equally with that of the other, on which the extract of belladonna had been placed previous to operating for cataract. Close attention should therefore be paid, in the treatment of both eye and ear, that the well organ do not take on morbid action with or after the diseased one. This will sometimes take place, without any cessation of the inflammation in the organ primarily affected.

That acute inflammation of the meatus as well as chronic, is purely sympathetic in many cases, especially with the gums during the period of dentition, we have abundant evidence.

Fortunately, both the primary and secondary irritation may be transferred to a third locality, whose sympathies are less active and whose structure is less important.

Acute inflammation of the external auditory canal, begins with a dull pain or sense of fullness in the ear, which increases to acute pain. The pain becomes lancinating, and spreads through the head and over the side of the neck, and is increased by the motions of the lower jaw.

A loud buzzing sound is experienced in the ear, accompanied with more or less deafness. The tube soon becomes more or less closed by the swelling; and vesicles, or even pus, will be formed, and a sero-purulent discharge will take place from the painful and swollen tube. In bad cases, the disease is ushered in by rigors, followed by severe febrile symptoms; the head partaking largely in the morbid sensations. The discharge is not unfrequently very offensive, especially after the disease becomes chronic, which it is very liable to do. Even blood in some cases is discharged. Most of the severe symptoms begin to subside as soon as the discharge is fully established.

The above symptoms are all present in simple inflammation of the tegumentary lining of the meatus; but are much increased, and followed by the bursting of an *abscess*, when the inflammatory action is deeper seated.

Abscess of the areolar tissue is a more severe disease, and may terminate by opening into the canal, or behind the ears, as I have seen in several cases.

Treatment.—General bleeding may, where the system is plethoric, and there is a strong tendency to cerebral congestion, be resorted to; but generally, free leeching, behind and before the auricle and below the lobe, will be found of great use.

Emollient poultices of linseed meal, bread and milk, or slippery elm bark, should be applied immediately after the free application of leeches.

The bowels should be well moved by senna and sulphate of magnesia—and the patient placed on the simplest vegetable diet. The head should be kept elevated, and, after free evacuations and poulticing, anodynes will be found useful, to procure sleep.

As soon as the swelling and inflammation subside, the meatus should be carefully washed out, by means of a syringe and tepid water. This should be done at least three times a day. The secretions should not be allowed to remain in the tube. A little clean soft wool should be kept in the passage, to absorb fluids as they are produced. This should be frequently removed and fresh wool placed in the canal. To prevent the establishment of a chronic discharge, the cure should be made complete by injecting, from time to time, after washing out the canal, a solution of acetate of lead, from three to five grains to the ounce of distilled water. Should this not prove effectual, a mild eruption over the mastoid process, induced by the application of croton oil, will be proper.

2. *Chronic Inflammation of the Auditory Tube.*—This condition of the meatus is either the consequence of acute inflammation, pre-existing in the passage; or it originates directly from exposure to cold, moisture, or a draught of air; or it is induced sympathetically, from an irritated condition of the gums or other parts. It may also be the result of a scrofulous diathesis. Where this is the case, the disease may continue for years.

Treatment.—After carefully washing out the meatus by means of a syringe and tepid water, the whole canal and membrana tympani should be carefully examined in sun-light, or with a strong artificial light. The whole passage will be found

red, tender, and more or less swelled. A small half-moon blister, cut to fit the bare space behind the ear—the surface and blister being previously moistened with vinegar—should be applied at once. Cooling lotions, chiefly solutions of the acetate of lead, with a little acetate of morphia, where the nervous irritation is considerable, should be carefully injected into the meatus, after the secretions have been syringed out. This should be done at least three times a day; while the blistered surface, after the plaster has remained on from two to four hours, should be covered with a soft bread and milk poultice. Should the tongue be furred or the bowels constipated, a mild cathartic should be exhibited. In young children, a little castor oil, or a teaspoonful or two of syrup of rhubarb, should be given. The diet should be moderate in amount; and all animal food strictly forbidden, and generally a purely vegetable food recommended. This disease, it must be borne in mind, although occurring in the adult is most commonly a disease of infancy or childhood. The following prescription will be found beneficial when used as above directed.

℞. Plumb. acetat; gr. x.
Morph. " gr. i.
Aquæ Distillat. f℥iii.
M.

or the following:

℞. Plumb. acetat. gr. x.
Aquæ distillat. f℥iii.
M.

In the adult, when the tongue is furred, and dark in the centre, two or three of the officinal compound cathartic pills should be given in the morning or at bed time; to be followed by a dose of rhubarb and magnesia, castor oil, or what is better, a cathartic of senna, sulphate of magnesia, and aniseed. The treatment in other respects is the same in adults as in children; except that

in the latter, the gums, when softened, should be lanced, or the local irritation, wherever seated, with which the inflammation of the meatus sympathises, should be removed. In either case, (adult or child,) should the general appearance of the patient indicate a scrofulous diathesis, we must resort to feruginous or other eutrophic remedies, administered internally. A good preparation for children from two to nine years of age and upwards, is the following.

℞.	Ferri carb. precipitat.	℈iss.
	Zingiber pulv.	gr. vi.
	Rhei pulv.	gr. xvi.
	Ol. anis.	gtt. i.
M.	Dividend in chartul, no. 15.	

Take two powders per diem, in a little syrup or molasses. The dose should be doubled in patients sixteen years old, and made three times larger for adults. In cachetic constitutions, the writer has found this prescription, with a milk diet, or a compound one of the milder meats and wholesome vegetables, fresh air, cold bathing, exercise and the use of the flesh-brush, very effectual. The compound syrup of sarsaparilla, with about four grains of the iodide of potassium to each fluid ounce, given in tea-spoonful doses, diffused in a wine-glassful of water, twice or three times a day, will be found beneficial in giving tone to the digestive organs and improving the general nutritive functions. The diet in this case should be Indian corn bread, mush, rice, boiled milk well salted, mashed potatoes, good stale bread, made of rye, wheat and corn mixed, cold water, roasted and ripe fruits; and, generally, vegetable and unirritating articles of food. In adults, mutton or good beef may be used in moderation, but no pork, nor animal oils.

3. *Chronic Inflammation with Polypi.*—If instead of finding the meatus red and smooth as above described, we discover it

filled up or partially closed with a fleshy substance, from whose surface and the surrounding parts, the fluids are thrown off, we may conclude that there are one or more polypi in the passage. The ordinary varieties of polypi found in other mucous passages, are also found here. 1, simple: 2, malignant or bloody. The polypi of the parietes of the meatus, have generally, small pedicles and large heads, while those of the membrana tympani, as will be seen in another place, are small, with broad faces and small apices.

Treatment.—The larger polypi should always be removed or destroyed in one of the following modes. 1. With a small scissors, clipping off the pedicle. 2. By means of a small pair of forceps, with which they are to be seized and twisted off. 3. The ligature, generally one of wire, by which they may be strangulated or even torn off. 4. Caustic. The nitrate of silver, in stick form, pointed and applied to the polypus once a day until it is destroyed. The patient should be placed in the ordinary position for examining the passage, the speculum applied and the instruments above indicated, or the caustic carefully passed to the polypus. After the extirpation of the polypus, it is generally well to apply the nitrate of silver, in stick, to the surface, or to destroy the root, as it is well known that polypi like the vegetable fungi, are very apt to be reproduced and that rapidly, after mere excision or extirpation. Should this be the case, the growing substance must be repeatedly removed and the nitrate of silver applied to the diseased surface.

The accompanying inflammation, when any, should be controlled by the ordinary means; viz. blisters or croton oil behind the ears; with the injection into the meatus of a mild solution of the acetate of lead. "Si sordida ulcera sunt, (adds Celsus,) melius mulso elusunter; et tum aliquod ex his quæ supra scripta sunt, quod mel habeat, infunditur." He refers to several

stimulants, astringents, acids and wines, good, in his own words, "ad omnium aurium vitia." The following recommendation will be found, doubtless, to be good practice now as it was then; "Si magis pus profluit et caput utique tondendum, et multa calida aqua perfundendum, et gargarizandum; et usque ad lassitudinem ambulandum, et cibo modico utendum." We cannot forbear quoting the following elegant passage from the same author, and with it will close our account of polypi.

'Quod si super ulcera caro increvit, eaque mali odoris, et sanguinem fundit, aqua tepida elui debet, tum infundi et quod ex thure et aerugine, et aceto, et melle fit, aut mel cum aerugine incoctum. Squama quoque æris cum sandaracha contrita per fistulam recte instillatur." *Lib.* VI. p. 375.

Case 2. Mr. J. B., a young clergyman, consulted me in Geneva in the winter of 1848-9, for a chronic discharge from the right ear. He had consulted many physicians without material relief. The hearing distance, with my watch, was diminished to 1½ inches. On close examination with the speculum, in a good sunlight, I detected at the bottom of the meatus, and near the margin of the membrana tympani, two small red conical polypi, which bled slightly on touching them with a probe. The membrane itself was slightly thickened, probably from previous inflammations. I applied the nitrate of silver in the form of stick, sharpened to a point, several times on successive days. Used as an injection a solution of acetate of lead, four grains to the ounce; which I directed my patient to take home with him and use after washing out the passage with tepid water, twice a day. I afterwards learned from him that the discharge entirely ceased, but that some deafness remained; probably on account of the thickening of the membrane.

Case 3. In 1842, Dr. B. sent me a boy to the surgical clinic of the Philadelphia Dispensary, about eleven years of age, who, according to his mother's statement, had had a chronic discharge

for more than two years. On simple inspection without the speculum, I discovered the meatus to be nearly full of one or more polypi. The discharge was abundant and fœtid, and the general health of the boy seemed to be affected.

With a pair of small forceps I twisted out one polypus of considerable size, directed the use of warm water, and lead-water lotions and a blister behind the ear. At the end of four days, I extracted another, and at the end of another week still another. After each of the last two operations I applied the nitrate of silver to the parts and prescribed the carbonate of iron, rhubarb, and ginger. The polypi were finally removed and the parts healed, leaving a slight deafness, due doubtless to the thickened membrana tympani.

Case 4. Mr. O. A young merchant applied for relief from a moderate purulent discharge from the right ear, which had existed, off and on, from childhood. The hearing distance, by the watch, had diminished to about three inches. Tenderness on pressure of the meatus was experienced. On close examination with the speculum I found the membrana tympani red, thickened, and two or three small polypous elevations on its surface. A general tenderness existed in the course of the canal. He was first purged, and a blister placed behind the ear on the mastoid process, and then, with a pencil of nitrate of silver, the polypi were touched, through the speculum, daily, for about two weeks. A solution of nitrate of silver, two grains to the ounce, was used, together with ablutions with tepid water, twice a day. At the end of four weeks the discharge had ceased, and the polypi had disappeared, leaving thickened spots on the membrane.

Case 5. Mr. Brush has suffered from deafness for four years, with now and then a slight discharge from the left ear. A small polypus, red and conical, was found near the membrane, which has been entirely destroyed by four applications of the

nitrate of silver. The hearing is improved, but remains dull, as in the above cases.

4. *Inflammation of the Glandular Structure of the Meatus Auditorius Externus.*—This disease, according to Kramer, is one of the most incurable of those of the meatus. We must remember, however, that this author's account of the disease is a very confused one. He mixes up, under one head, acute inflammation (erysipelatous?) glandular or follicular inflammation, polypi, foreign bodies in the passage, chronic otorrhea, &c., &c., &c.

The symptoms of acute inflammation of the follicles are very nearly those of acute inflammation of the tegumentary lining tissues. The secretion of cerumen, which characterises rather the declining or chronic stage of the disease, will also point it out. The "ring of cerumen," around the membrana tympani, dwelt upon by Kramer, indicates nothing, as it is a very common condition of the parts, in perfect health. The collections of cerumen, which are so common, of a dark color and hard in consistence, sometimes filling one third, one half, or two thirds of the meatus, forming a complete plug, by which the function of hearing is very much impaired, will be spoken of elsewhere. These collections, it must be recollected, are frequently overlooked for want of careful exploration with the speculum and probe.

The practice of washing out the ears in the ordinary way, even with a syringe, produces a species of membrane on the external surface of this ceruminous plug, which may and has been mistaken, by a careless observer, for the membrana tympani.

Chronic Inflammation of the ceruminous follicles, is characterised by little or no pain or tumefaction, but is associated with considerable discharge of a very fœtid character. It is generally accompanied with more or less cophosis and noises in the ear. The deafness arises from the presence of the fluids in the canal, and the noises from the sympathetic nervous irritation.

Treatment.—In addition to the treatment recommended under the next head, or otorrhea, we should adopt more or less of an alterative practice in these cases. The use of muriatic or nitric acids both as washes in the proportion of ½ gtt. to the ounce of water, and internally in moderate doses should be resorted to. Washes of nitrate of silver will also be found of great benefit in these cases, care being taken at all times not to use the lotions in the meatus too strong. The sensibility of the parts, is perhaps as good a guide as any. Counter irritation long continued, and even issues on the back of the neck or on the arm, will be found useful. Should evidences exist of a more or less general derangement of the follicular structure of the mucous membranes, iodine, sarsaparilla, and other alteratives, should be resorted to. Some soft clean wool should be worn in the meatus, and should not be allowed to remain long saturated with the secretions.

Mrs. Dr. G., a lady of rather a strumous habit, requested my advice at the instance of her husband. I found the meatus of each ear, red, inflamed, and painful; discharging abundance of an amber colored fluid, which on being exposed to the air, at the external orifice of the meatus, rapidly dried into scales, which surrounded the opening, and irritated the integument in the vicinity. The hearing was materially affected and the pain, itching, and uneasiness were very great. I prescribed cooling cathartics, blisters behind the ears, and a eutrophic in the form of comp. syr., sarsa, with iodide of potassium.

The treatment was effectual, and in three weeks the disease was cured, after many other remedies had been used. This discharge will be found always to irritate the parts over which it passes; and the whole meatus in the above case was quite tender on pressure.

5. *Inflammation of Areolar Tissue.*—This inflammation is phlegmonous, and is characterized by deep seated and darting

pains, with heaviness of the head, tenderness of the passage, and noises in the ear. It terminates after very severe pain, in free suppuration, which should be encouraged by poultices, fomentations, and warm water.

6. *Inflammation of Periosteum and Bone.*—The inflammation of the areolar tissue sometimes attacks the neighbouring periosteum and bone by *contiguous* sympathy, especially if there be a scrofulous diathesis. On introducing the probe, after free suppuration, it will be found to come in contact with dead or exposed bone, which will, in many, if not most cases, exfoliate, and be thrown off.

Treatment.—The passage should be carefully syringed out with tepid water. The exfoliating bone should be removed as fast as possible when it becomes lose; and when any peculiar diathesis of the general system is associated with the local disease, eutrophic remedies, to meet the indication, will be necessary. In young children, the growth of the system seems to protect it from the spreading of this inflammation; the scrofulous diathesis, as is well known, in many cases passes off, or becomes internal, in the form of tubercles, in a few years. It is astonishing how much disease, in some instances, these parts will bear in young children, without destroying the function of hearing. The bony portion of the meatus and the mastoid cells will be involved, and portions of bone thrown off for months, and sometimes for years, without affecting materially the middle or internal ear. This fact should not, however, be relied on by the judicious surgeon in the treatment of the disease; on the contrary, every effort should be made to remove the affection as soon as possible.

7. *Erysipelatous Inflammation of the Meatus Auditorius Externus.* This may perhaps be divided into acute and chronic. The whole passage may be affected co-ordinately with the auricle, whether the disease be acute or chronic.

The acute form will demand the same treatment here as when located in the auricle.

In the chronic form, a scaly eruption is thrown off from the surface, which, mixing with the cerumen of the passage, tends to fill the latter, and cause deafness. Small vesicles are formed and burst into the canal, yielding a water viscid discharge, which is very annoying to the patient. A sense of itching with slight pains from time to time is experienced.

Treatment.—Counter irritation behind the ear, the introduction of mild oils, almond, the oleine of lard, mixed with a few drops of rose water, will soften the morbid collection of scales and sooth the irritated surface. At the same time care should be taken to keep the general mucous membranes in a healthy condition. We generally find associated with this condition of the ears, a dry and scaly skin—a furred tongue and languid digestion. These should be corrected by bran baths, laxatives, followed by sarsaparilla or other alteratives. Dulness of hearing is a very common accompaniment of this condition of the meatus and membrana tympani.

The various eruptions of the general surface are also transmitted to the meatus, measles, scarlet-fever, small-pox, and varioloid produce inflammatory affections and morbid discharges, which induce thickening of the membrana tympani, and other evils.

Otorrhœa.—The subject of otorrhœa, or a discharge, sometimes purulent, from one or both ears, is one of considerable importance, both to the patient and to the medical practitioner. The disease is very common, particularly in infancy and childhood. From being at first a discharge from the lining membrane of the meatus auditorius externus, affording relief to some other local irritation, and acting on the principle of *counter irritation*, it becomes chronic, and is itself a disease.

In teething, ophthalmia, and other inflammations, nature

very commonly establishes this discharge, which undoubtedly relieves these diseases.

From this fact, which is matter of common observation, both among the profession and the people, together with the aphorism which says, "Suppression of discharges from the ears induces diseases of the brain," it is an every day affair to see otorrhœas entirely disregarded, and no means whatever taken to heal them.

So general is this, that individuals reach the period of puberty with this affection in one or both ears. The evil consequences of such continued disease, with a regular purulent discharge for years, (in one case lately under my care of thirty-two years,) may be easily conceived. The lining membrane of the meatus becomes thickened; the membrana tympani is destroyed; the bones of the ear are loosened and discharged, the inflammation, as I have seen in more cases than one, attacks the mastoid cells, and forms fistulæ opening externally.

In some cases the progress of destruction is more summary, and the disease, passing through the delicate organs of hearing, attacks the membranes, and even the substance of the brain, producing *then*, and not till then, "convulsions" and death.

The latter termination, though by no means so frequent as might be imagined from the proximity of the disease to the cerebral organs, is yet sufficiently common to make the subject a matter of grave consideration. At the same time it must be borne in mind, that this *introcession* is liable to take place at any time during the existence of a chronic otorrhœa; and particularly is it the case on exposure to a cold and damp atmosphere, or to any of the causes of colds or inflammations.

The evils, then, of the prolongation of this disease, may be arranged as follows:

First. It is inconvenient, the fluids not unfrequently being very offensive.

Secondly. A permanently diseased condition of the meatus

auditorius is produced—or, the bones being attacked, we may have ulceration or suppuration established in the cellular structure of the mastoid process, which may continue for a long time.

Thirdly. The destruction or ulceration, or what is *very* common, the thickening of the *membrana tympani;* the latter result being, not unfrequently, induced in a few days from an otorrhœa. It is well known, in fact, that a very large proportion of individuals, who are supposed to possess good hearing, have partial deafness in one ear at least, and sometimes in both, from this cause.

The ulcerative process takes place rapidly in the delicate diaphanous membrane of the tympanum; and although it has been shown by some good writers that the perforations induced by ulceration, may by proper treatment, be healed; yet where there is no treatment, and the ulcerations heal up in the ordidary course of the disease, it is fair to infer that the perforations remain for life. I recollect when a boy, in company with others, boys and men, a common amusement among them was to blow smoke from the segars they were using, out *through their ears.* And a considerable per centage of these individuals in a country village could perform this feat. The destruction of the membrane itself, however, I suspect, is the most usual termination of the disease. After this it not unfrequently gets well itself, and the discharges cease.

Fourthly. The ossicula auris are loosened and discharged, and the fenestra ovalis is exposed to the contact of atmospheric air. The apparatus so important to good audition—viz., the membrana tympani and bones of the ear—being lost, the function must necessarily be very much impaired; in some cases the Eustachian tubes close, and in this way the external and middle ears are entirely impaired.

Fifthly. The possible, nay probable, occurrence of a transfer

of the inflammatory action to the brain or its membranes, by metastasis or *continuous* inflammation, is an argument of the highest importance in this discussion.

Sixthly. The partial or complete loss of the function invariably accompaning the disease, should be inducement enough for us to investigate the propriety of allowing these discharges to continue, without medical interference.

The arguments in favour of non-interference may be summed up in a few words:

First. It is a diverticulum of nature which it is dangerous to interfere with.

Secondly. It very frequently (the object of nature being obtained) heals up itself, leaving no great derangement of the organ.

In reference to the first, we would remark that although a diverticulum, or source of counter-irritation, and in some cases protecting important organs, yet the seat of the discharge is itself an important organ, and no man would select *that* as the place to establish counter-irritation in the case of disease in any other organ, especially as it is well known that a purulent discharge from behind the ear, the back of the neck, or the arm, would be productive of all the good effects claimed for a discharge from this locality.

We might with the same propriety establish inflammation in the eye, for the relief of cerebral, dental, or aural diseases, and in this way impair or destroy the function of that organ, whose structure is so delicate, and yet no *more* delicate than that of the ear.

But, say the advocates of the do-nothing-practice, what are you to do? "Suppression of discharges from the ears induces diseases of the brain," and daily experience shows this to be a fact. Granted. Cannot the disease be *transferred* from the organ of hearing to some other less important part, and there

maintained to an indefinite period without the danger of producing any evil consequences? Certainly it can; and if not *cured* in the sense meant by the above aphorism, yet its seat of action may be changed, and ultimately, by judicious attention to the case, allowed to heal up entirely, as is the practice in almost any other instance, where for a time an issue or purulent discharge is desirable. There is nothing peculiar in the structure of the ear, that gives it any superiority as a seat of inflammatory action, to relieve other parts in a diseased, or tending to a diseased condition. So far from this being the case, we are of the opinion that the skilful physician is not justified in allowing this discharge to continue a *single day* in *any case*, where he, by slight irritation behind the ear, or the back of the neck, or other parts, is enabled to arrest it, but on the contrary he should be as anxious to stop it as he is to arrest a purulent ophthalmia or other inflammatory affection of the eyes.

We cannot agree with Dr. Bonnafont, as quoted in No. 5, of "Ranking's Abstract," that "chronic mucous discharges from the ear are always owing to ulceration of the parietes, of the external auditory canal, or of the membrane of the tympanum." For it is well known that polypous and other growths produce the same discharges, and great care should be taken in the examination of the auditory canal, with the speculum in a *sun light*, lest these productions escape our notice. They should, in fact, be always *suspected* to exist in cases of chronic otorrhœa. That "these discharges, generally very easily treated in their acute stage, frequently become very obstinate, and terminate in disorders which almost always involve a more or less serious degree of deafness, and sometimes the death of the individual," are facts which should influence the profession, we are fully convinced.

We have found, in reference to the treatment, that in the early stages, in uncomplicated cases, the production of moderate

irritation behind the ear—with careful syringing, first with tepid water, to wash out the secretions, followed by a solution of the plumb. acetat., in the proportion of from two to six grains to the ounce of distilled water—was all that was necessary. A small half-moon blister, or a drop or two of croton oil, or the latter used in the form of unguent, are means usually resorted to, to establish this irritation. When complicated, however, with general or local disease, acting as concomitant, and sometimes, as the cause of the otorrhœa, the treatment must necessarily be varied to suit the case. Scrofula, particularly in children, is a very common condition connected with the disease, and requires the usual constitutional treatment, in addition to the local applications. General debility, gastric irritation, papular eruptions, spreading erysipelatous and other cutaneous diseases, induce otorrhœas, and should be treated accordingly. Cases of simple acute otorrhœa, induced by cold or any of the common causes, are treated so successfully by the above, or similar means, that the publication of cases would scarcely be deemed advisable. Of the chronic forms, however, which are considered more difficult to cure, and many of which are absolutely incurable, the following cases may be found instructive.

Miss B., aged fourteen years, light complexion, rather full habit, has had a discharge from both ears for about a year; hearing distance with a watch, in left ear, one foot; in the right the watch could be heard indistinctly when placed in contact with the ear. The treatment consisted in washing out the canal well, with tepid water, and then throwing in the aqueous solution of the acetate of lead; four grains to the ounce; and the application of blisters behind the ears. The hearing began to improve immediately, so that at the end of a week the discharge from the left ear had ceased, and the hearing distance increased to six feet. The hearing distance in the right ear was restored to four inches, the discharge continuing. At the

end of four weeks the improvement in the right ear became stationary, at ten inches hearing distance; the discharges though small, remained.

On close inspection it was found that a moderate sized polypous growth had been overlooked, on account of the tumefaction in the first examination, in the lower part of the middle third of the auditory passage. This was carefully excised, and the blister surface restored behind the ear—with the use of the aqua plumbi. In four days the discharge had nearly ceased; the hearing distance advanced to two feet; and in ten days the discharge of both ears no longer existed; the hearing distance was respectively six and ten feet.

Second case, August 1846.—Mr. B., an artist, dark complexion, aged thirty-four years, has had a discharge from both ears ever since he was two years old. The hearing distance, as indicated by my watch was, in the left ear two inches, in the right ear four inches.

On examination with the speculum, the membrane of the tympanum of *the left ear* was entirely destroyed, together with the bones of the middle ear. When air was driven by the patient through the Eustachian tube, the fluids were *seen* to bubble and heard to rattle in the ear.

The discharge from this ear was not great, and chiefly of a thin watery character.

The membrane of the tympanum of the right ear was destroyed to about two-thirds of its extent, and the bones of the ear were exposed; the handle of the malleus projected into the portion of the membrane which remained, which was also thickened and ulcerated, discharging with the surrounding surface a large quantity of fœted purulent fluid. The Eustachian tube was here also pervious, as shown by the air press and catheter, and by voluntary sufflation.

Half-moon blisters were applied behind the ears, and an ear

lotion of four grains of the acetate of lead, to an ounce of water was directed, to be applied after carefully syringing the ears out with clean tepid water three times a day.

This treatment was continued with the use of a mild astringent gargle, (the throat being slightly inflamed,) for three days, when my patient left the city for his residence, some eighty miles distant, in New Jersey, to return at the end of a week or ten days.

On the 31st of August, he again called upon me, and I found the blistered surface healed. The discharge from the left ear had ceased, and the internal surface was dry and shining. The hearing distance had increased to four inches.

The discharge from the right ear had diminished, but the process of destruction was evidently still going on. The hearing distance had however improved to about five inches. The blisters were re-applied with directions to add a small quantity of the ceratum cantharidum to the ordinary dressings, in order to keep up the irritation and discharge. The strength of the lotion was increased to six grains of the acetate of lead to the ounce, and the fluid extract of sarsaparilla, as prepared by Maris & Co., of this city, was directed to be taken in teaspoonful doses twice a day. The gargle to be continued—exercise in moderation to be taken, and to avoid coffee, and most of the unnecessary stimulants. On the 2d of September he left for his home, the hearing distance having increased to six inches in the left, and seven inches in the right ear. The discharge from the right ear almost nothing.

Sept. 17th.—The hearing continues in the improved condition; the discharge from right ear still to a small extent. The sulphate of copper in solution was directed as a lotion. The etherial vapour was introduced a few times through the Eustachian tubes, with some small improvement in the sensibility of the nerves of audition. The ears were directed to be kept

warm, and protected from dust and changes of temperature, by the use of wool in the auditory canal.

On the 19th the patient left the city for his home, with the hearing improved in the right ear to ten inches, the discharge having *entirely ceased;* and in his left to something more. One year nearly has passed away and the improvement continues.

8. *Foreign Bodies in the Meatus Auditorius Externus.*—The frequency with which accidents of this kind occur in the practice of every physician, make them a matter of considerable importance. The bent form of the passage, with the great sensibility of the part, particularly when irritated and inflamed by the presence of a foreign body, present great difficulties in the way of its extraction.

A collection of the ordinary cerumen of the canal, producing not unfrequently considerable deafness, and accompanied with various noises in the ear, may generally be brought away by means of the ordinary ear-scoop or curette, followed by the judicious application of pure warm water. Water, according to the experiments of Haygarth, is the best solvent of the ear-wax, and ought, consequently, in all these cases to be used in preference to the various oils and other substances sometimes recommended.

When ants, caterpillars, spiders or other insects creep into the meatus, the introduction of a little olive oil will be proper, which will have the effect either to destroy them, or, by filling their spiracula, cause them to come out voluntarily.

When dead, if small, they may easily be washed out with an ear-syninge and water. "For this purpose, the point of the syringe ought to be pressed gently against the edge of the meatus, so that it may occupy as little of the diameter of the tube as possible, and when the injection arrives at the membrana tym-

pani, the regurgitation will force the body upwards."* Should the insect, however, be too large for this, it may in most cases be taken out, without much trouble, by means of a pair of small forceps.

The greatest difficulty will always be found in the extraction of more solid bodies, such as beans, peas, cherry-pits, pieces of glass, lead, iron, and similar substances. The evils which the protracted retention of such articles in the meatus entail, are inflammation of the lining membrane and neighbouring tissues —ulceration of the membrana tympani, destruction of the ossicula auris, and purulent discharges, involving the temporal bone itself, and even the membranes or substance of the brain.

The following case reported by Fabricius Hildanus, and quoted by Samuel Cooper, will illustrate some extraordinary symptoms resulting from this accident:

"After four surgeons, who had been successively consulted, had in vain exerted all their industry to extract a bit of glass from the left ear of a young girl, the patient found herself abandoned to the most excruciating pain, which soon extended to all the side of the head, and which, after a considerable time, was followed by a paralysis of the left side, a dry cough, suppression of the menses, epileptic convulsions, and, at length, an *atrophy of the left arm.* She was cured by the extraction of the piece of glass, which had been in her ear eight years."

Cherry-pits, grains of corn, beans and other substances, which expand on being exposed to the fluids of the part, in addition to the irritation induced by their presence, become embedded in the tissues, and in this condition are very difficult to remove. I have found it impossible to succeed with the forceps or other instruments ordinarily used, and the operation recommended by some of the old aurists, of cutting down upon the meatus *behind*

* Buchanan.

the auricle, makes the matter no better, and is consequently very properly entirely abandoned by the profession.

I have been enabled, by means of an instrument used by dentists for the purpose of cleansing the cavities of decayed teeth, to extract cherry-pits and grains of corn, which had baffled the skill of some of our most eminent surgeons. The instrument is about four inches long, and will be sufficiently explained by reference to the accompanying cut.

Fig. 6.

The patient sits upon a chair, and an assistant supports his head, turned to one side, throwing, if possible, a strong light upon the ear affected. The instrument is carefully introduced, and pushed forwards until it reaches the substance, when, keeping the curved edge towards the axis of the meatus, it is rapidly passed beyond the body, between it and the wall of the passage. As soon as this is done, the surgeon will find that he has complete control over it, and by traction can easily dislodge it from its bed. A repetition of the operation is much easier, both to the surgeon and the patient, and will in most cases be sufficient to extract the foreign body.

The previous introduction of some bland oil, as recommended by Velpeau, for the purpose of allaying irritation and causing the foreign substance to glide over the surface with greater facility, may be of use—but I have not found it of much importance. After the operation, the introduction into the meatus of some weak lead water may be necessary, or even the establishment of counter-irritation behind the ear or on the nape of the neck.

CHAPTER III.

DISEASES OF THE MEMBRANA TYMPANI.

1. *Acute Inflammation.*—No period of life is exempt from this disease, but it is far more frequent in childhood and youth, than in adult life or old age.

Symptoms.—A sudden pain in the ear, termed an ear-ache, with darting pains in the direction of the upper part of the throat, but no increase of pain on opening or closing the mouth. The pain which extends through the middle ear is deep seated and acute. These symptoms are frequently mistaken for nervous ear-ache, and 'anodyne drops' are poured into the meatus, only to increase the agony of the patient. In mild cases the pain will cease when the patient experiences a free perspiration, which will take place in the morning, or towards morning, after a night of pain. On examination, in the latter case, the membrane is found moderately red and inflamed; but soon returns to its normal color and condition. In the more severe forms, the membrane presents a very red appearance, the vessels being large and filled with blood. The depression in the membrane disappears and suppuration sets in freely, producing an abundant purulent discharge. The consequences of the suppurative action may be arranged as follows, according to its intensity and duration: 1. Thickening and opacity of the membrane, being of a pearly white color. 2. Perforation in one or more

points of the membrane. 3. Partial destruction, to the extent of one fourth, one third, or one half, leaving generally the manubrium of the malleus covered by a portion of the tissues. 4. The malleus itself, or the incus and the orbiculare may be discharged through the meatus, but this is more generally the result of chronic inflammation of the parts, continuing for months or years.

The duration of the milder forms of the disease, is not beyond a few days, sometimes a few hours. The consequent opacity of the membrane is slight, and soon disappears. In the severer forms, especially where any constitutional diathesis predisposes the tissues to destructive inflammatory action, several days or weeks may intervene before the disease is checked. The consequences are more serious in proportion to the intensity and duration of the inflammation.

The sympathy between the ears, it is said, induces one to take on the disease on its subsidence : this however is doubtful. The causes which produced the first attack, continuing, will, of course, produce the second.

The *causes* of this disease, are all those which produce inflammation elsewhere. Draughts of cold air, cold water, wet feet, the use of stimulating drops and injections, and other irritants designed to relieve some slight affection of the ear, perhaps. Indurated cerumen, never, perhaps, produces this disease. The prognosis is generally favorable, especially before suppuration sets in. Badly treated or neglected myringitis may extend to the middle or internal ear or brain; but great carelessness alone would allow of this. The deafness which follows the disease, will of course be in proportion to the change which the parts have undergone. The orifices, however, produced in the membrane by ulceration, when small, according to the testimony of some of the English Surgeons, will sometimes heal up spontaneously. If this be so,—and the writer has no

experience of his own to refer to on this head, except in cases of artificial perforation of the membrane—,hopes may be entertained, that the hearing will improve gradually, even after this accident. Kramer and others of the continental surgeons do not give credence to this idea. The extreme facility with which these perforations heal when artificially produced, would lead us to suppose it quite possible after ulceration.

Dr. Yearsley holds the following language in reference to this question. "With regard to the interesting question which has been so much debated, can loss of the membrane be repaired? and to which the negative has commonly been given, one important distinction must be made as a preliminary to its consideration. We must distinguish between those cases in which from accidental causes, or the pressure of the matter, the membrane has been merely perforated without loss of substance, and others in which, from ulceration, the greater part of the membrane has been entirely destroyed."

In the first class of cases, I have no hesitation in declaring that nothing is more common than for the membrana tympani to cicatrise. Numbers of persons suffer in their childhood from suppuration of the tympanal cavity, and the exit of matter through the membrane, in which, in after life, no solution of continuity whatever can be discovered by the most searching examination, but in which there are evidences of cicatrisation. In the accidental forms of the affection, the drum frequently closes up perfectly within a few days after its perforation—(Braith. no. 18, p. 241.)

Ulcerations, however, of the membrane, seldom occur at once, but are gradually developed, except in very severe cases, when the process here, as in other tissues, sets in rapidly, and destroys the parts in a short time.

Diagnosis.—The ear should be carefully examined with a speculum, in a strong light, and should the passage be closed,

or partially closed by cerumen, it should be washed out with a syringe and tepid water; provided the patient can, or will bear it —care being taken to do it gently. The membrane will be found either partially or entirely red, in proportion to the severity of the inflammation. There is now no difficulty in detecting the disease, ocular demonstration, placing it on the same footing as many other surgical diseases.

Treatment.—In mild cases, a little bland olive or almond oil, poured or dropped into the meatus will assist in soothing the irritated and inflamed membrane. A few leeches behind the auricle, or below it, followed by a sinapism, or when the inflammation is very painful, or has begun to suppurate, a fly blister over the mastoid process will be proper.

General bleeding is very seldom indicated. A moderate cathartic or laxative may be, especially if the tongue be furred and the pulse strong. Pediluvia, with warm drinks, on retiring, after the action of the cathartic, will assist in determining action to the surface. The patient, as above stated, is relieved by free perspirations. In more severe cases, slight nausea, kept up, by the use of a solution of tartar emetic, for a day or two, will assist very much in reducing the inflammation.

The head, according to Celsus—and it is good practice—should be elevated. The pain will sometimes be relieved in a very short time by fomentations (warm) of arnica flowers. For the rest, the treatment is the same, or nearly the same as that in acute inflammation of the dermoid tissue. Mild solutions of acetate of lead, either alone or with the acetate of morphia, will relieve the pain and reduce the inflammation in almost all stages of the disease.

The form of the disease, associated with inflammation of the tympanal cavity, "sometimes of a rheumatic character," will of course be more persistent, and the rheumatic element will demand special attention. I must caution the young practitioner,

however, against a very common error, viz. considering all otalgias as rheumatic, and prescribing diaphoretic and anti-rheumatic remedies accordingly.

Dr. Edward W. Clarke, of Boston, speaks of a form of the disease, which he denominates "subacute myringitis," and adds that it is a disease which comes on without any, or with very little pain; and is of "a most insidious character." "It comes on (says he) with little warning, progresses stealthily in its course, and in many cases no attention is paid to it, until organic changes have taken place, that are beyond the reach of treatment." He gives us but one case of this disease, which he fortunately was enabled to cure. The boy was seven years old, had had, "two years previous, scarlatina,—had light hair and eyes, and had four or five weeks previous to the attack of subacute myringitis, an attack of bronchitis. Easily caught cold in his ears, and had tenderness of the mucous surfaces of the nose, meatus and throat." A combination of circumstances, one would suppose, likely to induce a rapid derangement in the auditory organ, on the occurrence of any cause which would fix the disease. The truth is, the boy was scrofulous, and we all know that inflammations are always 'insidious' in constitutions affected with this diathesis. The case should have been termed 'strumous myringitis'—with nothing *very* insidious or peculiar about it.

2. *Chronic Inflammation of the Membrana Tympani, or Chronic Myringitis.*—"This disease (says Dr. Clarke) appears as the result, or more properly speaking, the sequela of almost every form of aural inflammation. It is usually a painless disease. Sometimes, however, it is accompanied with attacks of severe pain, which are followed by intervals of entire ease. Tinnitus, which is often a most distressing accompaniment of nearly every disease of the ear, (?) is frequently altogether absent in this. It is always attended with deafness, which is perma-

nent, (and partial,) decided, and little affected by variations of temperature, changes of the seasons or mental emotions." We cannot coincide with Dr. C. in his reference to the effects of variations of temperature, and mental emotions on deafness. We have always found that both these circumstances materially affected the function of hearing in these cases.

The disease is a very common one, much too common for the credit of our profession. True, a damp, variable climate, such as is found along our eastern or Atlantic border, in Boston, New York, Philadelphia, and perhaps Baltimore, doubtless causes the disease to be more frequent there, than in other higher, dryer, and more equable localities. Still, the general neglect of chronic affections of the ear, both on the part of the profession and of the people, should be enumerated among the causes of the greater prevalence of these diseases.

Treatment.—The treatment of this form of inflammation, resolves itself, chiefly, into counter irritation and a course of alterative remedies. The local application of a solution of the acetate of lead, or a very mild (1 to 3 grains to the ounce) solution of nitrate of silver, may be necessary; but counter-irritation over the mastoid process, or on the back of the neck, or on the temples, or what is perhaps still better, the alternate application of blisters to each of these localities, as fast as one gets well of the irritation, will be proper. The irritation in any one place should be continued, until the discharge from the surface, shall be the same kind as that from the meatus. Calomel, iodine, iron, sarsaparilla, or other alteratives should be resorted to, and persevered in, according to the indications. Tonics of all kinds will be found useful, under different circumstances. The iodide of potassium, in combination with the compound syrup of sarsaparilla, will be found a good alterative, given in the following form:

℞. Syr. sarsa. co. f℥iii.
Potass. hydriod. ʒi.
M. Take a tea spoonful three times a day, half an hour before meals, in a wineglass full of water.

All stimulating drops and injections should be strictly forbidden. Soft loose wool should be placed in the meatus, and every means taken to protect the inflamed surface from changes of temperature. Perseverance in this plan of treatment will generally prove successful, but the treatment must be continued for a length of time.

According to Dr. Toynbee, the individual tissues of the membrana tympani, may each be affected, without necessarily implicating the rest. The outer or epidermoid layer, for instance, is found in two diseased conditions. 1. It is hypertrophied. 2. It is moderately thickened and "studded by numerous small round masses," adhering to the fibrous layer. The fibrous lamina, according to Dr. T., are of a double description, circular and radiating; forming two tunics, each of which is subject to disease, distinct from the other. "The external surface of the outer layer is frequently the seat of chronic inflammation. When it becomes very thick and vascular; and is covered by granulations of a deep red color; polypi are also developed from it." Ulceration may destroy both layers and leave the internal or mucous layer untouched. This membrane will then "bulge inwards," falling upon the osicula. The fibrous layers are also the seat of calcareous deposits.

"The diseases of the membrana tympani, in which all its component structures are at the same time affected, are the following:—1. Hypertrophy, where the epidermoid, fibrous, and mucous layers are thickened. This not unfrequently proceeds to so great an extent, that the membrana tympani is ten or even twenty times its natural thickness, and it becomes

opaque, hard and dense, like a piece of cartilage.—2. Ulceration, where all the layers are destroyed, wholly, or in one part, so as to cause a perforation.—3. An increase of the external concavity, so that its internal surface is in contact with the promontory with which it is frequently firmly adherent.—4. An absence of the external concavity, in place of which it is perfectly flat.—5. Scrofulous degeneration, in which all the layers lose their natural structure. 6. Calcareous degeneration, in which there is often not a vestige of healthy structure in any of the layers. 7. An increased degree of tension. This state is most frequently accompanied by the presence of membranous bands, which connect its inner surface to the promontory stapes, or other parts of the inner wall of the tympanum. 8. Sometimes the whole of both fibrous coats are destroyed by ulceration, and the mucous layer remaining entire, falls inwards, and covers the surface of the promontory, and the inner wall of the tympanum. 9. Sometimes one-half of the membrana tympani is destroyed, and the border of the remaining half becomes adherent to the inner wall of the tympanum, forming a closed cavity. 10. The entire substance of the membrana tympani is ruptured. The part most subject to rupture, is that between the posterior margin and the handle of the malleus."—*Lancet*, April 13, 1850, p. 455.

Treatment of Ulceration of the Membrana Tympani.—When the ulceration is partial, the margins of the ulcers should be carefully touched with the sharp point of a stick of nitrate of silver, and the meatus protected with wool. Tonics and alteratives especially, the alterative use of calomel will be found necessary. Fortunately the process of ulceration is not generally very rapid, and time is thus afforded for a proper course of treatment. It is found, also, not only that small perforations of the membrane will close, and that the opacity which necessarily accompanies and follows ulcerations of the membrane, as

well as simple inflammations, without ulcerations, gradually disappears, especially in children and young persons. That the whole membrane, once lost, is ever restored, is scarcely to be credited; though cases of the kind are reported.

Counter-irritation, in the way of blisters behind the ears, with lotions of acetate of lead, will of course be proper. The former should be continued until the inflammation has entirely subsided. Where the ulcers are clearly the result of scrofulous inflammation, sarsaparilla and the various salts of iodine will be proper, as in other similar cases. Care should be taken *not to wet the head with cold water.*

4. In *Hypertrophy*, calcareous degeneration, &c., &c., it is well understood that the membrane is no longer capable of performing its functions. These conditions are the result of previous, generally chronic, disease.

Treatment.—The treatment in these cases, except when the Eustachian tube is closed, together with the tympanum, or there is accompanying disease of some other kind, is *to do nothing.* The membrane, under these circumstances, has been perforated with the view of improving the hearing; but the operation of perforation of the membrane, can scarcely be justifiable for any morbid condition of its structure, alone.

The questionable success of Sir A. Cooper, and others who have followed his example, has cast a doubt on the propriety of perforating this membrane in any case. Nevertheless the success attending some of the cases operated upon, not only by Sir. A. Cooper, but by Itard Mott, and others, justify us in the opinion of the author, in the performance of the operation in proper cases.

Perforation of the Membrana Tympani.—A great number of instruments have been invented with which to perform this simple operation. The well known fact, that the perforation will soon heal up, if it be a mere perforation, without loss of

substance, induced the invention by Himly of a species of punch, analagous to that used by shoemakers. This takes a piece entirely out, and leaves a round orifice. Sir. A. Cooper and Saissy, made use of a trocar. Buchanan, a quadrangular perforator, and Deleau, a complex instrument, which is much approved of by Kramer. Itard used a stilet of tortoise-shell; and others have recommended the introduction of bougies, catgut or lead, in order to keep the perforation open.

The author has used, with success, the ordinary tenotomy knife, considering, with Kramer, (p. 137,) that "it is always safest to operate with a simple instrument, that can be made to follow the movements of the patient."

We would prefer, however, most decidedly, especially in children, avoiding the necessity of "following the movements of the patient," and for this purpose have very successfully etherised the little patient. The complete quiesence produced by ether and chloroform, makes them invaluable in such delicate operations; and we would respectfully repudiate, in toto, the practice of "strapping a patient's head to a stool," recommended by some authors.

It is in fact almost impossible to fasten the head in a way that no motion can be effected by a struggling patient. The anethetic agents produce a degree of insensibility, which makes it equally impossible for patients to move. They are therefore to be preferred to any mechanical contrivance. The patient should lie on his side, with the ear to be operated upon, exposed to a full sun-light. The speculum will generally be necessary, in order to fully expose the membrane. The puncture should be made in the *posterior* inferior third. We here avoid the manubrium of the malleus, and have a larger field for the operation. Whatever instrument is used, a portion of the membrane should be fairly taken out. No after treatment is necessary.

The earlier cases of punctured membrane, reported by Sir A. Cooper, were published in the philosophical transactions, for 1802—one of these is reported by Mr. J. C. Saunders, in his work on the ear, as "continuing to enjoy the relief he at first experienced," in 1806. Itard has reported a number of favorable cases. Deleau reports thirty-six cases operated upon, without success.

Mercier reports a list of fifteen cases, in which the operation was performed. Six of these were performed for chronic thickening of the membrana tympani, and the remaining nine for obstruction of the Eustachian tube. One case alone, in which blood had been effused into the tympanum, was benefited by the operation. In this case, hearing was restored.—(*London Lancet*, 1845, p. 150.)

In reference to the disposition of the membrane, to heal over a perforation, Mr. Saunders makes the following remarks. It has been found that its disposition to close is very great, even when the Eustachian tube is impervious, and this is still greater when the tube is open.

Mr. S. adduces but one case, in which he had operated; it was that of a gentleman "who had been deaf for thirty years." "I placed him in the sun, (says he,) and passing a probe to the anterior part of the membrana tympani, made a small perforation." A crack immediately ensued, and in the space of a few seconds, he heard distinctly the chirping of sparrows on a tree at a great distance. The deafness returned at the end of a week. The operation was performed at intervals of two weeks, four times, and each time except the last, with the same effect.

Kramer cites no cases of his own, in which he has performed the operation.

Professor T. D. Mütter, of the Jefferson College, writes as follows, in reference to the operation, in answer to a note from the author.

"*Philadelphia, November* 15, 1850.

"DEAR SIR:—In looking over my case book, I find that I have perforated the membrana tympani, in cases of obstructed Eustachian tube *eight* times. These operations were performed several years since, and were productive of no benefit whatever to my patients. I have abandoned the operation as one calculated to do more harm than good. Yours &c.

"THOS D. MÜTTER."

On the other hand, my friend, Professor V. Mott, of New York, writes to me in the following manner, in reference to the operation:

"*New York, November* 14, 1850.

'DEAR DOCTOR:—As you kindly requested in yours of the 11th inst. any and what my views and experience are in reference to puncturing the membrana tympani in deafness; I state with great pleasure the results of my experience on that subject.

"I have a number of times punctured the membrane for imperfections of hearing, when I supposed it owing to a closure of the Eustachian tube, and with some manifest benefit frequently. In all cases in which there is a closure of this tube only, without a defect of any other part of the auditory apparatus, I think, philosophically and surgically, there is every justification for recommending and performing the operation. From some of the cases, in which I have tried it, being connected with something abnormal in the cavity of the tympanum or labyrinth, I feel as if I could account for the more or less partial success.

In a case of perfect closure of the Eustachian tubes, on each side, from an extensive syphilitic ulceration of the throat, which had caused a most painful deafness for more than fifteen years, I saw the most wonderful restoration of hearing that can be imagined.

"It was in the person of an Irish gentleman of high classical attainments, and brilliant imagination, and the effect of the puncture was most gratifying indeed. He could now hear conversation in the ordinary tone. His delight was extatic.

"When the second was perforated, he sprang from the chair, ran around the room, and exclaimed in a wild and frantic manner, '*I hear, I hear* the wind rustling among the leaves—*hark! hark!*—This,' said he, 'I have not heard for nearly twenty years!' Such thrilling delight I have never witnessed in any human being.

"From his fine taste and glowing description of its effects, I requested him to give it me in writing, which he did. It was truly poetical and beautiful.

"Yours truly,

"Dr. Bryan," "V. Mott.

Professor Hamilton, of the Buffalo University, New York, writes me, that he thinks it (the operation) "a surgical resort of positive, but limited value."

The effect of the operation will be as complete immediately after its performance as at any time afterwards.

Sir A. Cooper advocated a resort to this operation, in cases of closure of the Eustachian tube, or tympanum, without reference to the condition of the membrane, except its being whole. Hypertrophy, and analagous changes of the membrane, are the only conditions admitted by Kramer, as proper for the operation.

In a case of a boy five years old, mute, operated upon by the author in Geneva, New York, in 1849, the hearing was improved very much. From hearing nothing, except through solid bodies, he could hear his own name, when called from the opposite side of a room, with his face turned in another direction. Many other sounds were caught and recognised, but at the end of six

weeks the improvement gradually disappeared, and he returned to his former condition. There appeared to be some thickening of the membranes in this case, they were both perforated and chloroform was used to keep him quiet. An ordinary tenotomy knife was used in the operation, and a free opening made by turning the knife on its axis several times. The orifices, however, doubtless closed at the end of the six weeks.

Deafness with Perforation of the Membrana Tympani.—The announcement of Mr. Yearsly of his treatment of these cases, excited considerable attention in the mind of the medical faculty of England. The introduction of moistened wool or cotton into the meatus in contact with the membrane, was followed by an almost miraculous restoration to hearing; and hundreds, perhaps thousands of cases were, soon after the publication of Mr. Y.'s paper, treated in the London hospitals and dispensaries in this way. According to Dr. Wakley, however, the good effects ceased on the wool becoming dry. The patient's disappointment, after his sudden restoration to hearing, was extreme on finding it entirely gone again; and resort was again had to the surgeon, who produced the same effect, by placing *moist* wool or cotton in the ears, as before. "Dr. W., therefore," says he, "looked for something that would retain moisture in the ear, and fell upon *glycerine.*"

He reports ten cases, treated by the latter article, in the *London Lancet* of 1849—nine of whom were females. In none of these does he state the hearing distance by the watch, or the conditions of the Eustachian tube. He reports the membrana tympani, not perforated but thickened, or generally sound. The ceruminous secretion of the meatus was generally deficient. One patient was in the habit of improving his hearing by putting *water* in his ears.

The whole report is entirely too indefinite to be relied on in practice. That glycerine "is good for deafness," is the

language of a newspaper advertisement, and not that of a scientific medical journal. Several of the above cases were benefited only while the glycerine was used; and Dr. W. thought the patients would be obliged to use it always. Dr. Yearsly used the wetted cotton in cases of perforated membrane; and directed the cotton to be placed against a certain point of the membrane, or the benefit expected would not follow. What or where this point is, he does not tell us. The last cases reported in which glycerine was useful, were cases purely of dry ears, where a scaly eruption which covered the lining of the meatus was softened and thrown off, and the natural secretion restored. The writer has thus come round to the ordinary domestic notion of a "lack of ear-wax." All this proves that we do not yet know in what conditions of the meatus the glycerine is useful.

5. *Tension and Relaxation of the Membrana Tympani.*— These conditions of the membrane are, according to Dr. Toynbee dependent upon charges in the tympanum, or in the membrane itself. Their existence, however, in whole membranes may perhaps be earnestly doubted. Certainly it is very difficult to detect them. We will therefore pass them by.

CHAPTER IV.

DISEASES OF THE MIDDLE EAR.

THE great stress laid upon a proper exploration of the middle ear, in all inter aural diseases, by Kramer and other more modern writers, is doubtless founded in truth.

Reports of almost any important affections of the ear, with a statement of the result of a proper exploration, through the Eustachian tube, are generally unsatisfactory.

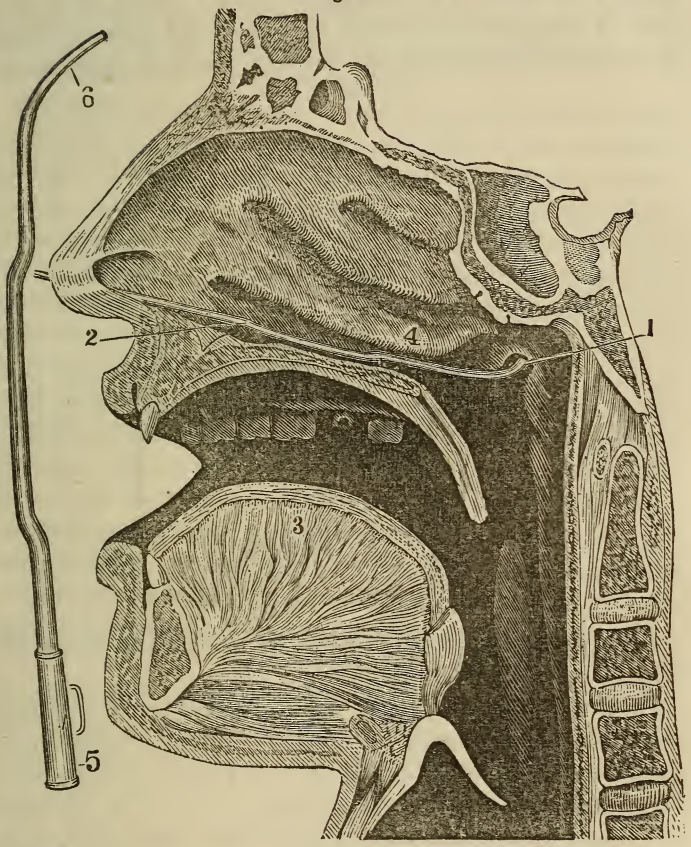
The hearing distance, the anormal sounds, with any or all accompanying symptoms, should of course be fairly stated; but these are very frequently insufficient without a knowledge of the condition of the middle ear, to be obtained alone by explorations of some kind, through the pharyngeal tube. The simplest means of examining the permeability of the tube and drum, is to direct the patient to close his mouth tightly, and press his nostrils together with his fingers; then attempt to blow or exhale forcibly. A sensation of fulness and of crackling will be experienced in one or both ears, if the passage be pervious. This is secured by the distension of the membrana tympani by the pressure of the air. Some little practice is generally necessary, before persons fully understand the process and object of this experiment; and if the surgeon be not careful he may be deceived by the representations of the patient.

The next process is that of catheterism. This is done by introducing the ear catheter, through the nose, into the cavity of the fauces and posterior nases; causing the end of the instrument to enter the pharyngeal extremity of the Eustachian tube. The air press, the breath forcibly expired with the passage catgut, or whale-bone, passed through the catheter and tube are the ordinary means of exploring the parts. These processes, are mostly diagnostic only, and not curative; though cases not unfrequently occur where they are really curative. The best catheter to be used for this purpose is, perhaps, one intermediate between that of Kramer and that of Pilcher. Another moderate curve added to Kramer's appears absolutely necessary to its introduction in many cases. The shape of the nasal passage is frequently, from the position of the lower turbinated bone, the oblique position of the former, or other malposition of parts, very tortuous, and many cases occur, even in adults, where it is impossible to introduce his catheter.

The cut (*fig.* 6) represents one calculated to meet these conditions. Several sizes should however be kept on hand.

The instrument should be made of the same temperature as the body, the point pressed suddenly on the floor of the anterior nases, and slid gently along that surface, with the convex surface upwards, until it reaches the posterior wall of the fauces. It is now gently retracted for about half an inch, and the point turned upwards and outwards, and pushed backwards until it again reaches the back wall of the fauces. The point thus enters the oblique step of the Eustachian tube, and appears moderately fixed. It may be retained in situ, by the hand of an assistant, or a band properly placed around the forehead, with a metallic or wooden handle, which may be fastened to the external ring of the catheter. The patient soon learns to press upon and retain the instrument in its place, during the manipulations necessary in exploring the tube. Blowing with the mouth

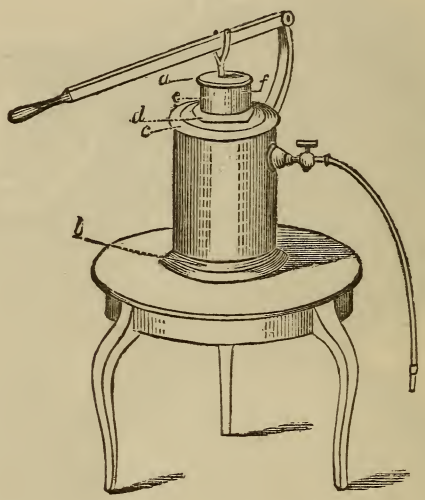
Fig. 6.



The cut no 6, will explain the mode of introducing the catheter, and exhibit the shape of the instrument. 1. Mouth of the Eustachian tube in the upper and back part of the throat.—2. Catheter, five and a half inches long introduced through the nose, with one end in the mouth of theEustachian tube at No. 1.—3. Perpendicular section of the tongue. —4. Inferior turbinated bone, which, with the bent bone, often obstructs the passage of Kramer's catheter. These are avoided by the bent form of this catheter.—5. Proximal extremity of the catheter, with a ring, which in the introduction of the instrument should be made to turn outwards towards the external angle of the eye, as it corresponds to the direction of the bent point of the distal extremity.—6. Free distal extremity.

through the catheter, the *air press*, (*fig.* 7,) turned on it, or a piece of cat-gut, or whale-bone, introduced and passed through the catheter into the tube, are the usual means of exploration.

Fig. 7.



Having premised these remarks, we now pass on to the diseases of the middle ear, and first:

1. *Acute Inflammation of the Tympanum.*—The mucous membrane of the tympanum is not unfrequently inflamed, by continuous sympathy acting through the Eustachian tube, from the pharynx and neighbouring surfaces; but there is, according to the best authors and ordinary professional observation, an inflammation which may with propriety be denominated idiopathic.

"The symptoms produced by inflammation of the tympanum, are most intense pain in the ear and head, a great degree of symptomatic fever, and sometimes slight delirium. The pain fluctuates, and its paroxysms resemble the tooth-ache. This resemblance has unfortunately caused it to be wholly neglected,

or very improperly treated. The case obviously requires the most active antiphlogistic treatment, and the absence of every thing stimulative." (Saunders, p. 57.)

The local pain and general febrile symptoms continue until suppuration has set in; generally ulceration of the membrana tympani follows, and a purulent discharge through the external meatus. Dr. Saunders speaks of this as a matter of course, and does not notice a similar discharge from the Eustachian tube. The latter however may be the only one, and the suppurative process, instead of involving the mastoid cells and meatus auditorius externus, may be entirely confined to the interior of the tympanum and Eustachian tube.

Relief from the great pain and other urgent symptoms generally follows the rupture of the membrane and a free purulent discharge. Great care should be taken not to confound this disease with otalgia or common nervous ear-ache. A somewhat intermittent character may mislead into the belief that it is purely nervous. A very great mistake would doubtless follow in the treatment. Indeed almost all the best modern authors, deplore this mistake so very common in practice. The mastoid cells being affected, ulceration may perforate their walls behind the auricle, and a purulent discharge from these bony cells may continue for a long time, particularly when a strumous or other morbid diathesis, so diminishes the vital and nutritive forces as to prevent the early healing of the inflammation.

The *consequences* of this disease when not checked early in its course may be—1. Perforation of the membrana tympani; 2. losening and destruction of the bones of the tympanum; 3. fistulous openings, one or more, through the mastoid process; 4. closure of the Eustachian tube or filling up of tympanum; 5. permanent disease of the petrous portion of the temporal bone; 6. Inflammation of the dura mater or brain, or both, followed by convulsions and death. Lastly, *deafness* is a very

common result, even should the membrana tympani escape the ulcerative process, and remain whole. It may be thickened and hypertrophied, or otherwise affected, so as to materially derange its functions.

When the inflammation has been slight, or has been reduced early, the Eustachian tube, or tympanum, may have "mucous engorgement," or one or more strictures may be formed in this canal, or it may be partially or entirely obliterated. The thickening of the lining membrane may result in this. Lymph thrown out in the tympanum may become organized, or partially organized, and a closure of the whole cavity may be the consequences: most commonly, however, as has been stated above, a freer suppuration follows the active stage of the inflammation, and a purulent discharge takes place.

Treatment.—When the case has been clearly made out, the treatment is very manifest. Antiphlogistics, such as bleeding cathartics, leeches followed by blisters behind the ear, and emolient poultices to the auricle and meatus. Bland unirritating applications to the meatus, rest, the ear and head elevated, with the use of remedies calculated to determine towards the skin, should be resorted to.

In plethoric patients, with a strong pulse, bleeding from the arm, followed by pediluvia and senna and salini cathartics. To the latter, should be added small quantities of tartar emetic, for the double purpose of increasing their efficiency and inducing a determination to the skin.

Dr. Saunders seems to think that the perforation of the membrana tympani, by the ulcerative process, is a necessary result of suppurative action in the tympanum; and says, "But, let it be admitted that the tympanum has suppurated. Ought the membrana tympani to be abandoned to a casual ulceration, or is it better to open it by art? I am inclined to prefer the latter; and if I could be assured by any symptom that suppura-

tion has taken place, I should not hesitate to make a small perforation of the membrana tympani; and to repeat it, if necessary, taking at the same time every precaution to suppress the fresh collection of matter." (p. 59.)

We do not agree with this distinguished author in this remark, knowing that the Eustachian tube is the *natural* outlet of the tympanum and will probably act as such in this instance. A fortiori, this, in our estimation, must be the case where proper treatment has been instituted early in the course of the disease.

To encourage the passage of the pus through the Eustachian tube, Itard and others have recommended the use of gargles, and the catheter, or air blown into the passage, by the patient himself. These means may sometimes be useful, and should not be neglected. The application of a strong solution of nitrate of silver, (40 grains to the ounce of water,) will be found effectual in reducing inflammatory actions in the throat and at the mouth of the tube. This should be applied by means of a piece of sponge tied to the end of a piece of whale-bone. Where a strumous diathesis exists, or the case is neglected or improperly treated, disease is very liable to run on into the chronic form, and it is then termed *chronic inflammation of the tympanum*, or simple chronic internal otorrhea. The disease known under this title may have originated in the tympanum, Eustachian tube or throat, or it may have passed from the external meatus, and especially the membrana tympani, to the tympanum.

In the latter case the membrane is of course either partially or entirely destroyed. (See diseases of membrana tympani and chronic otorrhea.) The chronic is distinguished from the acute form of the disease, by being accompanied with much less pain, sometimes none at all: hence by some writers the designation both in this and other cases of *sub-acute* inflammation. This designation is objectionable, inasmuch as it is founded chiefly on the absence or less urgent character of but one symptom—

pain. Now it is well known that this symptom varies very much in the different tissues affected with inflammation, whether the inflammation be acute or chronic. In some tissues the pain is almost none; in others it is very acute, and altogether disproportioned to the organic changes taking place. We therefore object altogether to the terms *sub-acute*, and prefer retaining the ancient division of acute and chronic, inasmuch as sufficient latitude is given in their definition for all practical purposes. It will be remembered also, that temperament, diathesis, and the condition of the system at large, at the time of an attack of inflammation, modify its effects and symptoms. In delicate structures like those of the ear, brain, &c., the '*insidious*,' character of chronic inflammation must of course be understood and guarded against.

It is impossible in practice to retain entirely the subdivisions of this disease, according to the tissue or tissues implicated. The mucous membrane may long be the seat of a chronic inflammation, whose effusions of serum, pus, or perhaps sometimes blood,—will find their exit through the Eustachian tube, or through the external meatus, or both.

This tissue may also become thickened and close the small tube of Eustachius, or there may be simply mucous engorgement of the tube or the tympanum, or both. In other cases, one or more strictures may be the result of inflammation of the mucous membrane of the tube. When the cause of the disease is some inflammation exterior to the parts, sore throat, measles, scarlet or other fevers, these conditions are often the sequelæ, and the patient finds some time after the subsidence of the fever, that the hearing is dull, on account of the temporary closure of the Eustachian tube. This however in many cases opens itself by discharging the mucus, more or less inspissated, into the throat. A species of plug, is in this way thrown off as soon as the surface of the membrane becomes covered by its

ordinary healthy secretion. The process as will be seen, may be facilitated by the air press, or the introduction of a properly constructed bougie, through the ear catheter.

Morbid productions in the form of polypi, and other fleshy developments, may also grow from the surface of the mucous membrane. These may close the internal orifice of the external meatus, and obstruct the exit in this direction of the pus, which in these cases is commonly thrown off in large quantities. As the membrane lines also the mastoid cells, inflammatory action may be communicated there, and passing through the lining membrane to the osseous and other structures, form fistulous orifices behind the ear.

The sub-mucous cellular tissue of the tympanum will of course be affected in chronic, as well as acute inflammation of the parts. The inflammation will however pass rapidly on to the *periosteum*, and even to the bone, particularly that of the oscicula and the small bones themselves. These latter become loosened, and force their way out through the external meatus. When the *bone* of the tympanum becomes affected, the dura mater, covering the petrous portion of the temporal bone, will become diseased, and the affection pass on in many cases to the brain itself, producing severe cerebral disturbances and death. In all forms of the chronic affection of the tympanum there is danger at any time, from exposure to cold and the other causes of inflammation, that the disease will assume the acute form, and pass rapidly to the membranes, or to the brain itself. This should be a strong inducement to try fairly, and for a length of time, all rational means of cure. (See Otorrhea.)

The great *symptoms* of this disease are deafness and a purulent discharge,—the latter being not unfrequently very fœtid, especially when the osseous structures are involved.

2. *Scrofulous Chronic "Otitis Interna,"* presents, in addition to the other symptoms of the disease, those of the scrofulous dia-

thesis, and is much more formidable in its consequences. It differs also in its treatment from the simple.

This form of the disease is one most common before the patient is seven or ten years of age. It is, in fact, found most frequently in childhood. The ordinary neglect of chronic, and even acute inflammations of the ear in children, so much deplored by Saunders and others, (see chronic otorrhea,) results in the complete establishment of this disease, and it may continue for many years. Whereas the strong disposition of the human system to throw off the scrofulous diathesis anterior to the period of puberty, is very favorable to obtaining a cure of chronic otorrhea, internal or external, before the disease becomes what may, with some degree of propriety, be denominated constitutional. The usual alterative remedies, with change of air, diet, location, habits, occupations, &c., must be resorted to in order to be successful. Generally the disease will yield, in children, under the use of a good vegetable diet, as indian corn, rice, sugar, &c., with occasionally small quantities of fresh, easily digested, *lean* animal food. The use of salt baths, sea bathing, and, internally, Saratoga, Virginia springs, or other mineral waters, will assist in supplyin g the system with elements, —the absence of which constitutes the diathesis.

Counter irritation, judiciously applied, will almost always be found useful. Blisters "behind the ears," allowed to heal occasionally, and then repeated, will be a very good mode of keeping it up. On the back of the neck, or arm, or shoulder, the same means may be resorted to, or better a seton or issue may be applied. The use of the tartar emetic ointment over the mastoid process is recommended by some; but the fact that pustules are accompanied with ulceration, and leave, consequently, unseemly marks, forms a decided objection to its use. A more moderate irritation and eruption can be obtained by the use of croton oil, either placed on the skin, by pouring a single drop

upon the point of the finger, and rubbing it on the part, or using it in the form of an ointment. The proportion which will be found effectual, is about one part of the oil to three parts of simple cerate. A liniment made in the same proportions, with oil of turpentine, olive oil, or soap liniment may be used to produce a moderate pustulation.

3. *Mucous Engorgement of the Eustachian Tube and Tympanum.*—This condition of the ear is characterized by a sense of fulness, and stoppage of the ears, as though a veil were thrown across the ear. Sometimes there is tinnitus, and various unusual sounds are heard. At other times nothing but a persistent dulness in the function of hearing, modified by the different conditions of the air on the system at large. In dull, wet weather, the deafness is often increased, as anything like a 'cold' is sure to increase the deafness. Free perspiration in bed, or after active exercise, or a free mucous discharge from the mucous membrane of the throat, will generally be followed by an improvement in hearing. Melancholy and other depressing passions increase the deafness, while excitement, especially that which is pleasurable, often improves it.

The deafness may either increase slowly or rapidly, and terminate in the total loss of hearing, or after a gradual diminution it may become stationary, and get no worse during the rest of life.

Causes.—A mild form of this disease will be found not unfrequently to exist after several of the eruptive fevers, particularly measles, scarlet fever, or varioloid. These not unfrequently get well spontaneously, and the patient feels a sudden cracking in his ear, and the hearing returns gradually. In some cases the deafness will continue in one ear, and little attention will be given until the function of that ear has been very much deteriorated. Sore throats, enlarged tonsils, or a disposition to irritation and inflammation of the mucous membrane of the

mouth, fauces, throat, and air passages, may be laid down among the most common causes. Above all, however, a scrofulous diathesis is the most common accompaniment and cause of the disease. In this diathesis, it is well known the tonsils are very liable to inflammation, acute and chronic, as well as enlargements; the latter condition, associated with deafness, has led some respectable aural surgeons to place it in the position of a cause of deafness, acting mechanically by closing the Eustachian tube. They accordingly recommend the extirpation of the tonsils, with the use of remedies, to diminish the swelling and inflammation of the neighboring mucous membrane.

The author has little experience in the matter, and can point to but few cases, where the excision of the tonsils has resulted, even when other measures were resorted to, in reducing the inflammatory condition of the mucous surfaces, or the restoration of hearing.

Treatment.—If the deafness be clearly made out, the treatment to be resorted to in these cases is clear. It is to remove the mucous obstruction, and to alter the condition of the lining membrane, so as to prevent the recurrence of the disease. Sometimes a voluntary, but forcible expulsion of the air by the patient, through the meatus, will relieve him, especially in slight and recent cases. Lentin, according to Kramer, recommends the patient's head to be placed on a table, "fills the diseased ear with water, and then directs the patient to expire forcibly, with the mouth and nose closed, and observes whether the water in the ear moves or not. If the latter be the case, he concludes that the Eustachian tube is closed." (Kramer, p. 171, first edition by Bennett.) A better mode than this, as a means of exploration, is, doubtless, to drive in the air in the same way, and place opposite the ear a lighted candle. The motion of the flame will indicate whether a current of air pass through the membrana tympani or not. Better

perhaps than this, is the plan of filling the mouth and throat with the smoke of a cigar, and expelling it, if possible, through the meatus in the same way, this will be quite visible to the eye of the surgeon, as it flows through the external meatus. These means, however, must mostly be considered as diagnostic only, not curative.

The use of the air-press, applied in the usual way, is of the first importance. "On making the attempt," the air either does not enter at all, or only with considerable effort, and accompanied by a gurgling noise in the middle meatus.

The application of the ear of the surgeon to the side of the face of the patient is sufficient, generally, to enable him to detect this "gurgling noise" of the air, passing directly to the membrana tympani; but he will find it very convenient to use the otoscope, (an elastic tube, twenty inches long, with each end tipped with ebony,) one end of which is placed in the external meatus of the patient, and the other in that of the surgeon. The introduction of air in this manner, is followed by a pleasant sensation of relief to the patient, a diminution of the tinnitus, and an immediate improvement in the function of hearing. The latter may be easily detected by the watch applied near the patient's ear.

When no gurgling noise is heard, and no amelioration in hearing at the first sitting, it may gradually occur after two, three, or four sittings. But if, after four sittings, no benefit result, the disease must be considered as consisting in *stricture*, or obliteration of the Eustachian tube. (Kramer.)

Sometimes, when there is a strong tendency to mucous engorgement, partial relief will be followed by a relapse, especially on the occurrence of a cold, or other inflammation of the vicinity. The tendency in scrofulous subjects, with large tonsils, thickened velæ palati, and a general puffyness of the mucous membrane of the throat and nasal cavities, is to a recurrence

of the disease, even when the relief from the simple process above stated, has been entire. In these individuals, a course of iodine treatment, the use of alum gurgles, with the application of the strong solution of the nitrate of silver to the fauces, (40 to 60 grains to the ounce of water,) washing the neck every morning with cold water, and rubbing it afterwards with a coarse towel, until the skin is red, regular and vigorous daily exercise in the open air, &c., will be necessary and proper.

The compound syrup of sarsaparilla, with the pottasii iodidum, should be freely resorted to, with decoctions of sarsaparilla, tincture, and other preparations of the guaiacum; and in young children, in whom, by the by, the disease is most common, a resort to some of the preparations of iron,—the best of which is the precipitated carbonate,—this, combined with powdered ginger and rhubarb, will be found a most excellent alterative in young scrofulous subjects.

The air-press should again be resorted to, after a fair trial of a course of eutrophics. Where secondary syphilis is the accompanying disease, the appropriate treatment for this, should be resorted to, especially a mild salivation, or the judicious use of the bi-chloride, followed in each case by sarsaparilla, or guaiacum. Little hope can be entertained should the complication be tertiary syphilis. Here, however, as in scrofula, we must resort to the various preparations of iodine.

In cases of deafness, after scarlet fever and measles, Dr. N. Morris, of the New York institution for the deaf and dumb, found the tube filled with mucous, the lining membrane red, and large veins running through it, and sometimes a preternatural dryness, both of the middle ear and the external meatus. (Annual Report for 1847.) M. Petriquin, reported some ten cases of deafness in old people, and others, from obstruction of the Eustachian tube, dependent, as he thinks it

generally is, on engorgement of the mucous membrane of the throat, cured by the use of the solid alum, applied to the fauces, with inflation. A very favorable report was made on the subject before the medical society of Lyons, by Brechet. The alum is also used in solution and powder. (Braithwaite, No. III., p 112, 1841.)

Stricture of the Eustachian Tube.—This may exist, either in the outer or inner half of the tube; and may be, as in the urethra, single, or there may be two, or more. The test here, is the air-press, or air blown in from the mouth of the surgeon. Should the air not pass into the tympanum, or pass imperfectly, (the latter will be known, by the sound being small and low, instead of crackling and rattling,) we have reason to believe there is a stricture. The air-press should be applied two, three, or four times, and then a piece of violin catgut, of the string A or C, should be cut a little over the length of the catheter; and then pushed about one inch beyond the point, and a mark with a pen and ink, made at each point, at the proximal end of the catheter. In this way, we have a black mark on the catgut, representing the length of the catheter, and indicating, consequently, when the point of the string reaches the mouth of the Eustachian tube, when pushed gently through the catheter; the second mark, one inch beyond, will indicate the distance the string has been introduced into the tube, when properly and carefully pressed forwards. The length of the tube being about one inch, the string should not be introduced further.

The mode of introduction is simple. The patient is made to sit upon a chair, in the usual way, for the introduction of the catheter: the latter is carefully made to enter the nose and opening of the Eustachian tube, and is then sustained in its place by a proper apparatus, or the hand of the patient. The

catgut, marked as above, is softened at the end by biting it with the teeth and moistening it with the saliva, then introduced to the end of the catheter. Gentle pressure will be necessary to cause it to pass into the Eustachian tube; and when it has passed the extent of an inch, a quick sharp pain will be experienced by the patient, as the point of the string touches the internal surface of the membrana tympani. The string will sometimes not pass easily, but move on, by pushing it a little, and go beyond the mark upon it. In this case, it will be found to have passed downwards into the throat, and the patient will feel it, and complain of its tickling him.

Care should be taken to keep the catheter steady during the introduction of the string. If the string pass freely into the tympanum, the effect will be an immediate amelioration of the function of hearing; though this may not continue. In the latter case, we are to expand or dilate the stricture, by allowing the catgut to remain in the passage. For this purpose, the outer extremity should be made fast to the skin of the face by means of a piece of adhesive plaster. The fluids of the tube will expand the string, and a gradual dilatation of the stricture will be the result. This process may be repeated several times. The other indications are to be met, of course, at the same time, and in the usual modes.

The use of silver or other wires, instead of the catgut, as dilators of the stricture, is to be reprobated. The catgut is safe, and they are not. It will be found necessary to resort at first, to small strings, and to increase the size from day to day, as the dilatation progresses.

4. *Impervious Eustachian Tube.*—In some cases, the above means of exploration will fail to indicate, or secure a passage to the middle ear: and the painful fact will become obvious, that the tube is impervious. A temporary closure, from mucous

or other fluids should be treated as above: but in old cases, where all the usual means fail to indicate a passage, or to make one, the prognosis is clear, and no assistance can be afforded by art. The effect of a permanent closure of this tube on the hearing, is to impair very much the function, and finally, often to destroy it altogether. No means, therefore, should be neglected, calculated either to open the passage, or to fix definitely the fact, that it is permanently closed. When the closure exists only in one ear only, we may expect that the function of the other ear, so far from being affected unfavorably, will become more acute.

From some pretty well attested facts, and observations, it would appear, that a loss of this passage is followed by a greater deficiency in the function of hearing, than the loss or closure of the external meatus above. Cases are reported of the congenital absence of the auricle, and closure of the external meatus, in which the individual could hear tolerably well by *opening his mouth;* and it is well known that in paying close attention to indistinct, or distant sounds, the mouth is instinctively opened. "The Rev. B. H. Benton, in a letter to the London (Va.) Chronicle, says, "strange, but not less true, I yesterday, saw a colored woman without ears; not only was she without the auricle or external part of the ear, but there is no trace of a foramen, or passage for sonorous vibration. The meatus is entirely closed, yet she can converse with others, and distinctly hear their words, for which purpose *she opens her mouth.*" (1850.) "The woman belongs to Mr. James Broaddus, near Caroline court-house."

Professor R. D. Mussey reports a similar case in the Amer. Jour. Med. Sciences, vol. xx., p. 537, 1837.

The following "Pathological Sequences of Acute Inflammation of the Fibro-mucous Structures of the Cavity of the Tympanum," as published by James Mercer, M. D., F. R. C. S. E.,

lecturer at Edinburgh, will show some of the pathological conditions not unfrequently connected with, and induced by, acute and chronic tympanitis. The sections are accompanied, and the subjects illustrated by numerous cases, taken from medical journals and standard works on diseases of the brain. They will exhibit more forcibly than a simple general statement of the fact, the dangers connected with both chronic and acute affections of the middle ear.

"*Section* 1. Caries of the parietes of the tympanum, producing meningitis, without destruction of the petrous portion of the temporal bone.

"*Section* 2. Caries of the parietes of the tympanum, producing meningitis or cerebritis, in consequence of destruction of the osseous septum between its cavity and that of the cranium.

"*Section* 3. Caries of the parietes of the tympanum, inducing phlebitis of the lateral sinus and internal jugular vein.

"*Section* 4. Caries of the parietes of the tympanum; necrosis of the petrous portion of the temporal bone; destruction of the portio dura, in the aqueductus fallepii, producing paralysis of the muscles of the face.

"*Section* 5. Caries of the parietes of the tympanum; necrosis of the petrous portion of the temporal bone; destruction of the gasserian ganglion, producing paralysis of sensation in one half of the face and mouth.

"*Section* 6. Caries of the parietes of the tympanum; necrosis of the petrous portion of the temporal bone; *opening of the internal carotid artery in its canal of the temporal bone,* either alone or in conjunction with the lateral sinus, or the destruction of the gasserian ganglion or the facial nerves." (*Monthly Journal.*)

From all that has been said, it will be seen, that the inflammations of the tympanum, whether acute, chronic, or specific,

are at once dangerous and difficult to cure. The almost necessary rupture of the membrana tympani, or perforation of the mastoid cells, shows that the disease is likely to make inroads upon the neighboring tissues. The treatment, consequently, must be, in the acute form of the affections, prompt and decided. Venesection leeches, cathartics, and a low diet will be found necessary and useful. When the throbbing pain, and the general character of the symptoms indicate that suppuration is taking place, it should be encouraged by emollient poultices, fomentations, &c., and when there is a *pointing* in the region of the mastoid cells, free incisions to the bone should be made. These may sometimes be followed by injections of tepid water into the tympanum, which will, in some cases, be evacuated into the fauces, through the Eustachian tube. There may be cases, when relief would be obtained in the early, though suppurative stage of the disease, in perforating the membrana tympani; but generally, this fragile membrane is soon broken by the inflammation attacking it on the internal surface.

In the chronic form, pieces of bone from the mastoid process, the small bones of the ear, &c., will be discharged from time to time.

Topical treatment is in these cases very important to protect the brain and its membranes. The following case, taken from several others in my day-book, will illustrate the chronic form, when associated with stricture.

J. O'B., the son of Jno. O'Brien, aged two years, residing in Jone's alley, Philadelphia, came under my care in 1842, as a dispensary patient, together with two other children in the same family, with measles. This child had sandy, curly hair, a freckled skin, and a large head. He was very much prostrated by the eruptive fever, and not expected to live during the whole of 48 hours of the disease. He gradually recovered, however, but was very irritable, appeared to suffer great pain

in his head and left ear. In a few days, a slight discharge was observed from the meatus, for which nothing of importance was done. In three days more a great swelling was observed behind the ear, throwing the auricle forward, and making that side of the head appear much larger than the other. After the application of flaxseed poultices for two days, the abscess bursted over the mastoid process, and discharged a large amount of pus and some blood.

As soon as this had taken place, the general health of the child appeared to improve very materially. He began to eat freely mashed potatoes, and to drink milk. Several fistulous openings were formed behind the auricle; the bone was easily detected through each, on introducing a probe, and the general tumefaction and apparent misplacement of the auricle forwards, though less after the openings had formed, continued for several months. The child was placed under the use of compound syrup of sarsaparilla and iodide of potash. The ear was kept as clean as the habits of his parents would admit of, by syringing the meatus daily with tepid water. When the sores became large from excessive granulations, they were touched with the nitrate of silver, and the parts kept moderately clean. In the midst, however, of filth and dirt, the child, although he had lost the use of his lower extremities, from the debility induced by the fever, gradually gained strength, and at the end of six months was running about with the others most vigorously. He appeared even to retain some hearing in the diseased ear, the fistulæ having entirely healed up, and the otorrhea having ceased.

CHAPTER V.

DISEASES OF THE INTERNAL EAR.

THE diseases of the internal ear are necessarily obscure, and the symptoms indicative of special organic changes have not as yet as been clearly defined. We are therefore left to make the simplest division possible, namely, that based on functional derangement. In examing these cases, we must of course resort to every precaution to establish the negative fact, that there is no disease of the external or middle ear.

The accurate and careful examination of the meatus, as well as a proper and thorough exploration of the Eustachian tube, are absolutely essential.

The divisions I shall adopt, are as follows:

1. Erethetic or acute nervous deafness.

2. Torpid, or chronic nervous deafness.

3. Sympathetic nervous deafness, accompanied with acute pain in the nerves of the ear, not immediately acoustic. The ordinary name of which, is otalgia, or ear ache.

1. The erethetic, or acute form of nervous deafness, may be distinguished by the following symptoms. 1. The degree of deafness, as indicated by placing a watch opposite the ear, will vary very much. In some cases, the ticking can be heard only when it is placed in contact with the auricle; in other cases, it

may be heard from half an inch to ten inches from the head, in one ear, while with the other it cannot be heard at all. 2. In these cases, the sound may be heard *always*, when the watch is placed between and held by the teeth. 3. The patient hears best in the *midst of a noise*. On board a rail-road car, even ordinary conversation will be distinctly heard and understood, while others cannot understand each other in conversation. This a very striking symptom and should be carefully inquired into. In the vicinity of noisy machinery, in the midst of loud sounds, as those of drums, &c., the hearing is better. The noise of falling water, the rumbling of carts, or loud conversation by a number of persons,—in all these circumstances, the function of hearing seems to be improved in erethetic nervous deafness. The reason of this appears to be, that the morbid impressions already existing in the nerves of audition are overcome by stronger ones; and the nerves thus placed in a better condition to act *under the will*, in receiving sounds, and the impressions from sounds from without. As in some forms of insanity, severe bodily pain so abstracts from the unhappy impressions of the mind, as to allow the individual to exercise his reason in a healthy manner. In the latter case, sudden danger, or any strong mental impression is sometimes known to produce the same effect. 4. The patient experiences a great variety of abnormal sounds in his ears and head, especially at night. These have been compared to the ringing of bells, the sound of falling water, the humming of bees, the simmering of a pot or kettle, the roaring of distant thunder, and sometimes to the explosions of guns or pistols. Generally the sounds are like the falling of water or the ringing of small bells.

It is true, that these symptoms follow chronic closure of the Eustachian tube and thickening of the membrana tympani; but

a careful examination of the case should be made before our diagnosis is made out.

It must be remembered, however, that chronic closure of the Eustachian tube will be followed by a condition of the nerves of audition, such as have just been described, and we may have both conditions exist at the same time. So, also, of chronic thickening of the membrana tympani.

I knew an eminent and eloquent clergyman, who never heard his own voice, and could not, consequently, pitch it in the early part of his discourse. His wife was in the habit of telegraphing him on the subject, until he became warmed up, and then his voice assumed the full sound of former days, when he could hear it. This gentleman suffered immensely from *deafening* noises in his head at night.

Treatment.—If there be any positive indications of the presence of inflammation in any part of the middle or internal ear, recourse must be had to antiphlogistics, such as leeches, blistering behind the ears, cathartics, low diet, &c., &c. Generally, however, no such condition exists, and to resort to blisters and ear washes, whether stimulating or other, is merely to waste the time of the patient, or subject him to unnecessary pain and inconvenience. Having determined that the Eustachian tube is pervious, the external meatus and membrana tympani in a healthy condition, we must resort to remedies which will act as nearly as possible upon the parts affected.

No general or constitutional remedies will avail, unless there be some derangement of the nervous system or digestive functions. A general nervous debility should be treated in the usual way, viz: tonics, iron, cold water, sponging, the flesh-brush, proper diet, &c., &c.

Any biliary or gastric derangement that may be associated with the disease should of course be removed; and should habitual engorgement of the vessels of the brain co-exist, this

should, if possible, be removed. In other respects, the treatment is simple, and in many cases effectual; in others, merely beneficial or palliative.

The well known fact, that *all* forms of partial deafness tend to total deafness, should stimulate us to retard its progress, or if possible, stop this tendency, when we in any way can. To retain audition at two inches by the watch, will be much better than to lose it altogether; and this in those cases may not unfrequently be done.

The introduction to the tympanum of the vapor of ether, generally the sulphuric ether, either cold or warm, is considered the best treatment. Aqueous vapor, or that of ammonia diluted with aqueous vapor, introduced warm has been found beneficial. The vapor of alcohol has also been resorted to, and that of vinegar.

The application of these vapors (the *best* of which is the sulphuric ethereal vapor) should be continued for weeks and months; paying close attention at the same time to the condition of the function of hearing; keeping, in fact, a diary of the hearing distance of each sitting.

A glass jar, with a cork in the mouth of it, in which two holes have been bored, and into one of which the gum elastic tube, or gum shelac tube has been introduced, may be prepared. The second hole in the cork is to be used to pour in a few drops of ether, and then to be covered by a piece of wood. The patient is to sit on a chair with one elbow (that corresponding to the ear affected) on the table on which the jar is placed; the end of the tube is to be adjusted to the catheter, already introduced to the mouth of the Eustachian tube. He may with one hand support the catheter and tube, and with the other pour a little ether into the jar. He should sit from fifteen to twenty minutes each time. The ether will rise and fill the jar and pass along the tube and catheter into the tympanum communi-

cating a sensation of warmth, and sometimes a soothing anodyne sensation.

The hearing distance in favorable cases will, at the end of each sitting, be sensibly improved. This should be done daily, or every other day, carefully watching the effects of the application. It will be found that damp weather will materially influence the function of hearing, particularly if it be also cold, or the patient contract a cold, or suffer from any material functional derangement of his organs of organic life.

Fig. 9.

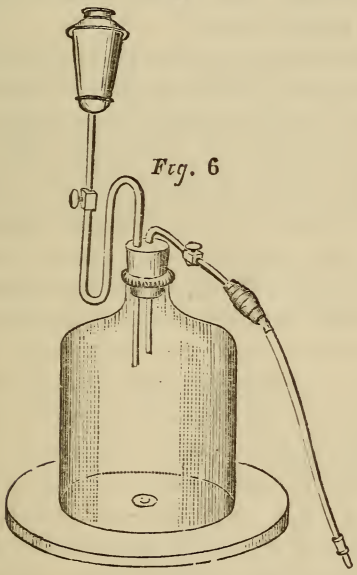


Fig. 6

The air-press may sometimes be substituted for the ether jar, or the latter may be heated by means of an iron ring passed over it after being heated in the fire: or the jar may be

placed in warm water to induce the more rapid evaporation of the ether. The author has seen many cases in which this treatment has very much relieved the patient's disease, and others, where it has diminished the deafness, and produced a stationary condition of the disease.

Another mode of using the ether, and one which I have found in several cases very useful, is to inhale the ether through the nostrils or mouth, until the throat is full of it, then close the mouth and nostrils and attempt its expulsion by forcible exhalation. This method drives the vapor into the tympanum, and is indeed the only way, in some patients, in which we can induce them to use the ether.

"Of all kinds of ethers (says Kramer,) the preference is beyond question due to acetous ether, on account of its extreme mildness. Sulphuric ether, ammonia, (especially in conjunction with camphor,) etherous oils, tincture of coffee, and the like, have always over excited the auditory nerve, even in my most careful trials of them." Each sitting in the use of the ether should occupy about fifteen or twenty minutes daily; and the catheter should be introduced, on alternate days, to the right and left ears, when both are treated; when but one is treated, the application should also be daily. The following case will illustrate the treatment in this form of nervous deafness, and is taken from among others in my note-book.

Miss S., aged eighteen years, daughter of a distinguished judge of the State of New York, was placed under my care in May of the year 1844. She was embonpoint, with very fair skin, and auburn or very light brown hair. She had gradually become more deaf for four years: and was now under the necessity of being close to a person addressing her, and of observing the features during conversation.

On the 4th of May, the hearing distance, as indicated by my watch, after the application of the air-douche in the

right ear, was four and a half inches, and in the left, previous to the use of the air-douche, about twelve inches. The air from the air chamber was distinctly felt by the patient to rush with "a crackling noise" into the tympanum. A slight uneasiness followed.

The mucous membrane of the throat and fauces was tumified and puffy, and the tonsils considerably enlarged. A considerable discharge of thick tenacious mucous took place from the fauces and throat. The Schneiderian membrane was very red, and bled very easily on touching it with the catheter. The latter instrument could be introduced, with care, to the Eustachian tube of the right ear, but not to that of the left, on account of the irritation produced in the throat.

She was directed to abstain from the use of coffee; to drink but little fluids of any kind; and to live on dry, chiefly vegetable food. The throat to be washed evening and morning with cold water, and rubbed off with a dry coarse towel. Early rising was recommended, and plenty of out-door air and exercise.

The following prescription was directed to be taken in table-spoonful doses, twice a day, in a wine glass-full of water.

℞. Syr. sarsa. com. f℥iv.
Potass. iodid. ʒii.

To gargle the throat freely, and often, with cold water.

On the 9th, the hearing distance of the right ear had increased four inches; and the left was still irritable, but relieved of much of the 'roaring' noise habitually in it, by the use of the air-douche.

11th. Considerable pain and noise have been experienced in the left ear; for which a mustard poultice is directed behind

the auricle; and for a slight discharge from the meatus, six grains of acetate of lead, in two ounces of distilled water, were directed, with which to inject the meatus.

An astringent gargle of alum, honey, and sage tea, was also directed to be used. On the 13th, the hearing distance of the right ear had attained thirteen inches.

14th. The hearing distance of the right ear, in a quiet room, is sixteen inches, and that of the left, a full arm's length and more. The irritation of the left Eustachian tube is subsiding; the passage being quite pervious to air and vapor.

15th. The hearing distance of the right ear, twenty-four inches; that of the left, as before.

16th. She experiences the sensation of a watch ticking in the ear. Confounds this with the real sound, and thinks the hearing the same as when first examined.

17th. Hearing the same. Air-douche, ether and cold water.

20th. Hearing distance ten inches in right ear, twenty-four in the left.

22d. Hearing distance continues to improve.

On the 25th, inflammation attacked the left meatus, and a blister was directed to be placed behind the ear. The falling back so suddenly was due, evidently, to a cold, caught from exposure to a storm in a country excursion, with some young friends. There is a strong tendency, however, to inflammation both in the mucous surfaces of the throat and tympanum, as well as in the lining membrane of the meatus of each ear. As this inflammation subsided the function of hearing rapidly improved, until the 29th and 30th, when she caught another cold, and on the 31st, the hearing distance had returned almost to the original condition in the right ear. Appropriate remedies were used for the 'cold,' and, on the 4th of June, the left ear had gained four inches again. The application of the ether to the right ear, and of the air-douche to the left, was continued

up to the 12th, when the ether was applied alternately to each ear.

This treatment was continued to the 26th of June, when circumstances made it necessary for her to return home, with the promise to return in the autumn. The hearing distance was then about three times the extent it was at the beginning of the treatment, in the right ear; and about twice the distance in the left ear. My note book says, "she commenced on the 6th of May, with roaring in her ears; since that she has experienced ticking and other sounds, but she now has no sounds whatever, and expresses herself as having more consciousness in her ears."

I have frequently seen this lady since that time; and although she has since been married, and did not "return in October," yet the improvement continues to the present time. She can hold a conversation across a room without difficulty in an ordinary tone.

This was a strumous case, and liable frequently to mucous engorgement of the Eustachian tube on the occurrence of slight changes in the weather, particularly if they were from a dry to a wet or damp condition. The air-douche with astringent gargles, or the nitrate of silver, applied in solution to the throat, were the appropriate remedies. One great thing gained is the stationary character which these cases assume, after well marked improvement. If nothing more than this was gained, it would be worth the trouble to resort to the treatment above detailed.

2. Torpid Nervous Deafness.—This is distinguished from the last form of the disease, by the absence of any kind of noise in the ears, and by a more complete loss of the function of hearing.

The *treatment* is the same, when any is resorted to, except that it should be a little stronger. The ether should be heated

or driven in with more force, or the vapor of ammonia, or alcohol, or even water itself, may be used. The writer has often used the latter article to inject the tympanum, and found that water does not irritate the parts much, especially when tepid.

Torpid nervous deafness, is the deafness of old age, or of any other cause which destroys the function of the seventh pair of nerves. Very little or no good can be expected to result from stimulating a nerve so altered as to receive no impression from the ordinary media of audition. At the same time it must not be forgotten, that deafness is by no means a necessary concomitant of increasing years; but that frequently, the gradual or sudden deafness of old persons is entirely due to one or more of the causes enumerated under the head of cophosis. The writer is disposed to believe that many old people gradually lose their hearing from neglect, and want of proper attention to the conditions of the external meatus and tympanum. As a general rule, we should treat diseases of the ear in old persons precisely in the same way as we do those of the young.

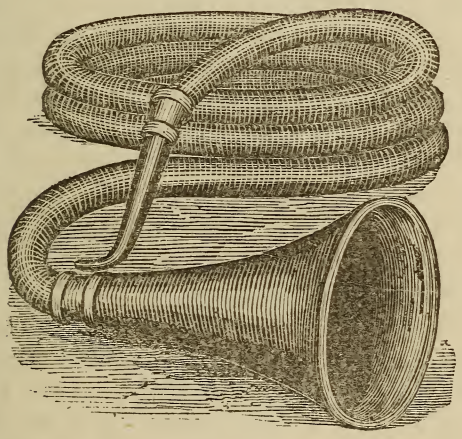
When, however, either an old or a young person becomes so deaf as to be unable to hear ordinary conversation, and no relief is to be expected from any remedial measures, some means must be resorted to, to place him in communication with those around him.

The ordinary practice of placing the hollow of the hand behind the auricle, in order to increase the number and force of the vibrations, has doubtless suggested the use of an enlarged auricle or trumpet. This is placed on the ear and a tube from it enters the meatus, and should be long and large enough to straighten and enlarge the latter; with this simple contrivance many deaf persons are enabled to hear sermons and other public addresses with comparative ease.

For private conversation, which is so unpleasant to many deaf persons, (on account of the unnatural screaming which some resort to,—in that way producing a very painful impression on the ear,) the best instrument by far that the author is acquainted with, is a gum elastic tube, similar to the otoscope used in England.

This tube has a bent horn, or ivory pipe, at one end, of the size of the external meatus, into which it is inserted. The other end terminates in a trumpet-shaped expansion, made also of horn, or ivory. The whole tube is about eighteen or twenty inches long, and may be easily carried in the pocket. Conversation may be held with this, with a deaf person, while walking along the street. (*See cut, fig.* 10.)

Fig. 10.



Some curious facts have been observed in reference to deaf persons, who have, by the use of a solid, particularly a metallic body, placed in contact with a post or pillar, in a room filled

with persons in conversation, been able to follow the course of an argument held in their vicinity, when not at all suspected of hearing any thing by those listened to. The writer knows a gentleman who often surprises his friends in this way; who says he does it by close attention to the sounds transmitted through the pillar, key, eye-tooth and bones of the head; and by watching the countenances of the interlocutors.

It should always be remembered by those who converse with deaf persons, that raising the pitch of the voice, so far from making them hear, absolutely prevents it. We know an old lady who is very deaf, who says to those addressing her in this way, "do not speak so loud, or I cannot hear a word; speak low and distinctly, then I can hear."

3. Sympathetic Nervous Deafness.—Our present ideas of the functions of the nerves of special sense, do not permit us to suppose that they are subject to neuralgia, in the ordinary acceptation of the term. Certainly not the nerves of audition, vision and olfaction. This, however, does not preclude the possibility of a neuralgia of those nerves which are accessary to the function of hearing. The otic ganglion, the plexus around the membrana tympani, corda tympani, one or all, may be the seat of pain. Are not many of the cases of paroxysmal ear-ache to be referred to these nerves, and to a condition of them, analagous, if not idenical with that of tic doloreux? Have not writers and teachers been lately disposed to pass by these conditions of the nervous fibres connected with the organs of audition, in their anxiety to establish pathological conditions of the other tissues? We believe they have, and while a simplification of all aural affections into otalgias and otorrhea, as was formerly the case, is to be deprecated; the total disregard of otalgia, as such, is equally wrong. The disease may be detected by close examination of the ear, and attention to the symptoms. The absence of positive symptoms in the outer

and middle ear, the acuteness of the pain, absence of hearing, and especially a disposition to periodicity, will lead the careful surgeon to the conclusion, that the disease is nervous.

Care should be taken to detect the cause: to see whether it be associated with rheumatism, or be the chief symptom of a paroxysm of intermittent fever, or be connected with secondary syphilis, or some organic irritation transmitted by sympathy to the nerves of the ear: as a diseased tooth or teeth, inflamed throat, or tonsils, or both. A draught of cold air, cold feet, or foreign bodies in the meatus, are also causes.

Treatment.—Where a rheumatic condition of the system exists, the disease will be relieved or cured by combining preparations of colchicum, guaiacum, or other anti-rheumatic remedies, with those calculated to relieve neuralgia. The writer has relieved simple neuralgic cases very quickly, by placing a few drops of chloroform on some cotton or wool, and inserting it in the meatus. Anodyne drops, such as an aqueous solution of opium, sulphate of morphia, or arnica, will be found beneficial in these cases. Great care should be taken not to introduce alcohol, or other stimulating fluids into the meatus. In malarious districts, the intermittent form of the disease is not uncommon; and should be met with quinine, and other anti-periodic remedies.

Pure tic doloreux of the ear should be treated with carbonate of iron, combined with quassia, ginger, and other vegetable tonics and stimulants.

When associated with tertiary syphilis, the various preparations of iodine will be found beneficial and necessary. Anodyne poultices, and fomentations of hops, arnica, opium, or other narcotics will be found very useful. Care being taken to protect the parts from atmospheric changes of temperature.

We cannot conclude this chapter, without warning the junior practitioner against confounding this disease with acute inflammation of the membrana tympani, or external meatus, known under the title of ear-ache. A simple examination of these parts with the speculum will decide the question, and affect very much the treatment.

CHAPTER VI.

DEAF MUTES.

It is a pretty well known fact, that children who lose their hearing previous to the seventh year of their age, or even later, lose also the faculty of speech. Indeed any considerable loss of the function of hearing, making it difficult and troublesome for a child to catch and understand individual words in ordinary conversation, will induce him to neglect gradually the use of the function, and resort to signs as a means of communication. Should any defect in the structure of the ear exist at birth, sufficient to destroy hearing, the individual is, of necessity, dumb. Speech will never be acquired.

Professor Hamilton, of Buffalo, reports one case of dumbness without deafness; but this condition of things very seldom exists, and depends, probably, on some defect, either in the larynx or cerebrum.

For the relief of persons so unfortunate as to be deaf and dumb, several noble institutions have been established in the United States. That established in Philadelphia has been in operation for many years, (since 1820,) and numbers about one hundred and thirty-four pupils—seventy-two of whom are males, and sixty-two females.

These come from the States of Maryland, Delaware, Pennsylvania and New Jersey.

In a table of the forty pupils admitted during the year 1850, 29 were born deaf.

1	lost hearing,	by disease, at	8 years of age.
1	"	measles, at	4 "
1	"	whooping cough,	2 years of age.
1	"	inflammation of ears, at	6 months.
1	"	typhus fever, at	1 year and 6 months.
1	"	scarlet fever, between	4 and 5 years.
1	"	"	4 and 5 months.
1	"	"	3 and 4 months.
2	"	"	5 years old.
1	"	"	1 yr. and 8 months.
1	"	"	3 yrs. and 6 "
1	"	"	7 years old.
1	"	"	1 year old.
1	"	"	8 years old.

It will be seen by the above table that more than half of the cases were those of congenital deaf-dumbness. The question of hereditary transmission has not yet been fairly investigated; but it is now well understood that the marriage of cousins, and other near relatives, is decidedly favorable to the development of these and other imperfections. The principals of these institutions, in New York and the Eastern States, are now well acquainted with the fact, that not only defects in the organs of hearing, but in the brain, producing idiocy, epilepsy, and insanity, are the direct results of such marriages.

The deaf do not, necessarily, transmit deaf offspring; on the contrary, the reverse is the most common.

It will be seen by the above table, that the period within which deaf-dumbness occurs is limited to the first eight years

of life; and that, generally, the diseases of infancy destroy hearing between the second and sixth year.

The instruction of these unfortunate individuals is a very important feature in the philanthropic operations of the present day. Many things may be communicated to and from them by the ordinary natural or instinctive signs made by the body; "and it is very important to the deaf mute, that his parents and friends should cultivate the language of signs, and encourage him in the use of them as early as possible.

"Let them observe the child, and imitate the signs he makes. When he is pleased with anything, invent a sign for the thing, and repeat that sign many times afterwards. Distinguish different persons by signs, suggested by a scar, mole, beard, or any little peculiarity which the person may possess.

"Imitate the actions of riding, sewing, eating, mowing, cutting, throwing, sowing, &c.

"For 'good,' kiss the hand. For 'bad,' bring the hand to the lips, turn the palm down and throw it from you. For 'glad,' pat the heart rapidly, with a cheerful expression of countenance. For 'sorry,' rub the clenched hand on the heart, with a sad expression of countenance.

"For 'black,' draw the end of the forefinger along the eyebrow.

"For 'red,' touch the lips with the forefinger. For 'love,' cross the hands and press them on the heart.' For 'hate,' push both hands, the palms out, from the heart, as if repelling something from the left side. For 'lie,' move the forefinger across the mouth horizontally. For 'true,' place the forefinger perpendicularly across the lips and thrust it forwards."

CHAPTER VII.

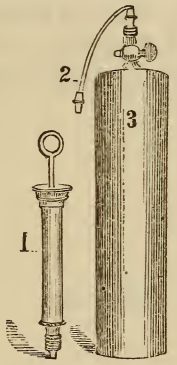
CONCLUSION.

It is not the province of the aural surgeon to speak of the instruction of deaf-mutes: yet every physician and the citizens generally, should be acquainted with the best mode of inducting the unfortunate individuals in the language of signs. The present attempt to introduce a work written by an American author, and embodying the opinions and practice of American surgeons on aural surgery, will, it is hoped, meet that indulgence which a first attempt generally demands. That the diseases of the ear are very much neglected, in our country, a practice of some twenty years has fully proved to us. An attempt has been made to supply the necessary literature by the republication of foreign works,—many of which are voluminous, verbose, and expensive: and, if we are to believe their fellow writers, not at all to be relied upon. The authorities quoted in this work are personal experience, and that of American surgeons, as far as practicable, and it could be obtained. It is very evident, however, that the whole subject is more or less underrated by some who write books. The following wise sentence, taken from a very recent work which pretends to present American operations and authors, will afford its readers with but a poor idea of the writer's opinion or knowledge of the number and value of operations

upon the ear: "Washing out the external and internal auditory tubes, with perforation of the membrana tympani, or perhaps the mastoid cells, really constitutes the *entire* portion of aural operative surgery, and are certainly easily executed."* This is the work that the learned publishers informed the author, would entirely supersede his little book, and make its publication quite unnecessary!!!

The air-press which the author has been in the habit of using, is a simple tin chamber, (3,) supplied with an air-tight stop-cock, to which, after the chamber has been filled with air by means of the forcing pump, (1,) is attached a pipe with a brass nozzle. The other extremity of the flexible pipe, fits by means of another brass nozzle, (2,) into the external opening of the catheter of the Eustachian tube.

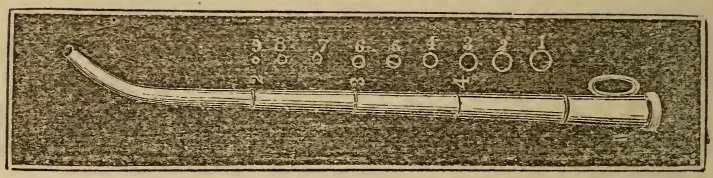
Fig. 10.



We think it well to add also a cut of the catheter usually known as Kramer's. It is about five inches long, and divided and marked by inches. Many operators who have followed the directions of this author, prefer his catheter.

* Smith's Operative Surgery, Part I, p. 219.

Fig. 11.



We have only to say, in conclusion, that many more cases of the various diseases might have been added under their several heads; but, in our opinion, this would but add to the size and expense of the book, without improving it in proportion.

Several cases are under treatment at this moment, of nervous deafness: diseases and loss of the membrana tympani, and otorrhea.

The author would be happy to receive any communications from his former pupils, those of Geneva, Castleton, and the Philadelphia Colleges of Medicine, or from other members of the profession, containing instructive cases, or well made post mortem examinations.

THE END.

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